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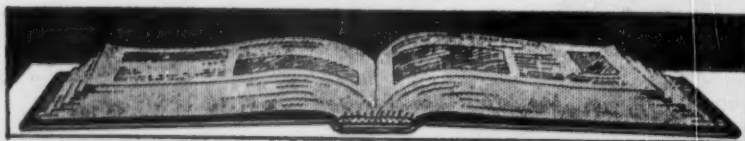
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Reviews

Water for America

By Edward H. Graham and William R. Van Dersal. New York. 1956. Oxford University Press. 112 pages. Illustrated. \$3.50.

Recently there have been several books on water and its vital significance to America, but none has hit upon the approach of this excellent publication, which is subtitled "The Story of Water Conservation." Here we have a most effective topical presentation of the subject, with a dramatic picture on the left-hand page and concise and informative text related to the picture on the facing page. Water is thus discussed from fifty-four points of view. Both authors write with outstanding authority as members of the staff of the U.S. Soil Conservation Service, and they have provided us with a book that should enjoy wide general reading and particularly should be on the shelves of every school library in the country.

Exploring Death Valley

By Ruth Kirk. Stanford, California. 1956. Stanford University Press. 82 pages. Illustrations by Louie Kirk. \$1.75.

Death Valley, the author of this interesting and excellent tourist's guide tell us, is a place where superlatives and paradoxes abound. Its fact and folklore are fascinating. Its geology and variety are surprising, and "beneath the hostile veneer of Death Valley there is beauty: the vast openness of the land, the patterns of sand and salt in the Valley, the wind in the mountain pines, the hour of sundown when the heat breaks and shadows move down the Panamints and out across the desert floor." From this quoted paragraph it may be seen that this is more than merely a guide for the tourist; it is a sensitive appreciation of one of our unique national areas.

Learning and Instinct in Animals

By W. H. Thorpe. Cambridge, Mass. 1956. Harvard University Press. 493 pages. Illustrated. \$10.00.

Ethology is the name given to comparative study of animal behavior. In Europe zoologists have to a large extent concentrated on observation and study of innate behavior, or instinct. In the United States there has been much emphasis

on study of acquired habits, or learning. Much of this work has gone without integration of the data assembled. In this interesting book the author seeks to synthesize these two methods of approach. The first part of the book is concerned with the general principles and concepts involved in the study of behavior. The second part surveys the part that learning plays in the organization of the behavior of all of the principal groups of animals. The chapter on birds is specially interesting since it takes issue with the concept that the brain structure in the avian world limits the ability of birds to learn.

The Year of My Rebirth

By Jesse Stuart. New York. 1956. McGraw-Hill Book Company. 342 pages. \$4.75.

Author, poet, novelist, this author is also beloved as a writer about his native Kentucky hills. He is, too, farmer, lecturer and teacher. After concluding a lecture at a Kentucky college, he was suddenly stricken with a heart attack and quickly hospitalized. Determined that he should not die, Jesse Stuart fought back stubbornly. This is the story of that fight, the story of a year of rebirth and what he saw, felt, heard and cherished during that twelve months. Readers who have never suffered a heart attack will find rebirth in this book, also.

The Stars

By Irving Adler. New York. 1956. The John Day Company. 128 pages. Illustrated by Ruth Adler. \$2.95.

In a preface to this book Lloyd Motz, Associate Professor of Astronomy at Columbia University, says: "In this book the reader is introduced very skillfully to the properties and behavior of stars. Starting with the first inquiries that enter a person's mind as he watches the stars come out one by one after the sun has set, Mr. Adler builds up a grand edifice of what the astronomers today know about their universe. By means of simple analogies drawn from everyday activities he succeeds in clarifying many complex concepts that usually have meaning only for the astronomer." This book is, indeed, a fine introduction to the stars for the young reader, or for anyone who has no training but a developing interest in astronomy.



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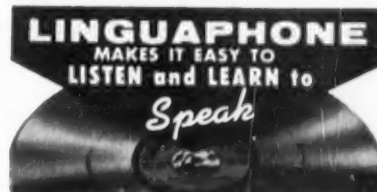
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Nature Magazine

JANUARY, 1957 VOL. 50, NO. 1

Published by the **AMERICAN NATURE ASSOCIATION** to stimulate public interest in every phase of nature and the out-of-doors, and devoted to the practical conservation of the great natural resources of America

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Nature IN PRINT

By HOWARD ZAHNISER

Two Writers about the Wild

THE TITLE
STORY is Wil-
liam Byron
Mowery's re-

cently published *Swift in the Night and Other Tales of Field and Wood* is "the one purely fictional selection in this book," Mr. Mowery assures us, and yet it stands first, it gives the book its name and it was first published in *The Saturday Evening Post*, while other items in the volume were first used in less important or more specialized publications. The rest of the book, we may as well note at once, is arranged in three sections called "Sangamon Sketches," "Northland Trails," and "Catskill Adventures," and is well summarized by our author himself in his foreword as follows:

"'Sangamon Sketches' includes four selections from a decade of outdoor work and publications while I lived in Illinois. 'Northland Trails,' devoted entirely to the wolf, comprises experiences and field studies of mine in the Canadian sub-Arctic, where I spent parts of a dozen summers gathering material for my fiction of the Northwest Territories and also doing some collecting for museums and scientific institutes. 'Catskill Adventures' covers my latest period, during which I have been teaching at New York University and authoring stories, articles, and books."

But this volume made up of (1) wolf and bear tales from Canada, (2) accounts of rearing young wild birds, watching rabbits in their high hops, and hunting mushrooms in Illinois, and (3) sketches of woodchucks, foxes, and the refreshment of wild salads in the Catskills (with an Ozark excursion and a meeting there with a ginseng hunter)—this volume is named for, and opens with, the piece of fiction entitled "Swift in the Night." It is the story of a fox vixen that lost her own cubs and found a litter that had lost their dam—a tale of tragedy, violence, suffering, and beauty.

Fiction treatment

Why was this one tale told in fic-

tion? Is it Mr. Mowery's imagination? Did he invent it? Did he actually know about such an incident? Did he perhaps know only part of the tale and have to invent the rest because there could be no other way of realizing the whole story and having an explanation of it all?

Mr. Mowery himself gives "a word of explanation." He does not actually answer these questions we ask. He does not tell us the source of the "materials" he used in its creation, but the fiction itself he explains thus:

"I chose to cast this material in the short-story mold," he writes, "because, as every writer knows, fiction can sometimes convey a deeper truth, a deeper understanding and insight, than a factual telling. This story, I hope, will cause you to put aside your humanhood for a little time and see, as more than one of my magazine readers expressed it 'what it feels like to be a fox.'"

What indeed is it like to be a fox? or a woodchuck? or a wolf? And did anyone ever wonder what it is like to be a mushroom—or wild salad?

Mr. Mowery observes that "this matter of freshness is really vital with leafy greens," but he completes the sentence by saying it is "one big reason why the greens you gather outdoors and eat at once are incomparably higher in food values than the grocery store item." His delights with mushrooms are rather similar.

But not so with wolf, woodchuck, or fox. They are fellow creatures in our consciousness. Mr. Mowery observes that the "obscure, heavy-footed chuck abounds everywhere." He believes that this is due to the marmot policy of "playing it safe." He thinks this policy has a "fearful price," that "chipmunks and the bob-o-link, the otter, the cheery cardinal and all the other creatures that prefer to live perilously would . . . say that the woodchuck can keep his dull safety—they'll take the sunshine and winds, the dangers and also the delights, of the outdoors and the open sky." Nevertheless

the woodchuck does abound and "often, sitting bolt upright on a sunny hillside, it is the only wild creature of any size that we see for miles and miles." One feels that Mr. Mowery has made great effort to understand what it is like to be a woodchuck.

Friendly to wolf

Perhaps he has tried even harder with the wolf. His exciting tales of wolf-bear struggles and his exposes of false accusations are all calculated to win sympathy for the wolf, which Mr. Mowery calls "the most maligned creature in our land, bar none." He subscribes to a consensus of experts, 1, 2, 3, 4, as follows:

"1. In wild, remote districts where there can be no danger to economic interests, like livestock, the wolf should be allowed to exist, as part of our original fauna and balance of nature.

"2. The alleged danger to humans, which crops up in various forms, can be regarded as entirely nonexistent.

"3. The occasional individual wolf that comes out and starts depredating should be eliminated, as it easily can be now. This is known as selective control.

"4. In reasonable numbers, which are nowhere exceeded now, the wolf should be regarded as a beneficial factor in regard to game herds."

Calling this "potential program" "informed and practical," Mr. Mowery says he believes "it would win out if only public opinion would get behind and push a little."

Certainly he himself pushes more than a little—for wolf, and chuck, and fox and, one concludes, for all the wild creatures who probably require most of all in this more, and more man-modified world a putting aside of "humanhood" for a little time to see . . . "what it feels like" to be a fox—or wolf. And to his most conspicuous effort in this volume our author devotes the creative yet fact-responsible art of fiction. It is interesting.

Long's collected works

In the concluding paragraph of another recent book, a posthumous volume entitled *The Spirit of the Wild*, Dr. William J. Long remarks that nothing could be "more erroneous or misleading" than the idea that in order to understand the animals we should seek "a special psychology, distinct from our own." Rather he declares, "we know a little, a very

little, of our own psychology, and that is the only measure we possess to lay upon the life of any creature."

This eloquent clergyman, teacher, and wildland traveler, whose writings on English and American literature have probably brought him as many readers as have his outdoor books or listeners to his sermons, left at his death in 1952, at age 86, "a voluminous sheaf of manuscripts in a safe in his Stamford, Connecticut, home." Among them were the papers that comprise this volume—fast-reading, fascinating, as though told by the campfire, which indeed is one of the chapter headings, and through all the exciting or curious incidents of the book is the intriguing interest in the nature of the animals. Noting the chapter headings not only characterizes the book's contents (as a reader might wish from a review) but also illustrates this intriguing curiosity:

"Musquash the Cross One," "Learning from the Fox," "Learning from the Deer," "Trailing the Timber Wolf," "Learning from the Mountain Lion," "Learning from the Moose," "How a Porcupine Throws His Quills," "Learning from the Black Bear," "Learning from the Beaver," "Keonekh Goes Fishing," "Told by the Campfire," "Jack-Light Witchery," "Home on the Range," "Animal Lust of Killing," "The Saving Instinct," "In Quest of Animal Psychology," and "The Question of Animal Reason."

There have been those who have thought that William J. Long was depending too much on "our own psychology" as "the only measure we possess to lay upon the life of any creature," that he attributed to wild animals human traits, that he had not had William Mowery's sort of admonition "to put aside your humanhood" and see "what it feels like to be a fox." One can see in *The Spirit of the Wild* how indeed Dr. Long's excited interest in the actions of wild animals seems to lead him into a desire to explain their actions—for himself and his readers. He carries almost constantly an admiring wonder at the way in which wild creatures behave "successfully," and he sees them sharing with human beings what we might call intelligence. He seems hardly likely to be misleading however. Perhaps half a century ago, when our quest for the knowledge of wildlife that has so greatly grown in the meantime

was, as it were, getting oriented, it was important that there be an insistence on the objectivity of observations. However that may have been, there seems in this book interesting entertainment and the sort of increase of general knowledge and understanding that one gains around a campfire listening to exciting tales and speculating over their meaning—something for the reading table if not for the reference shelf.

In fact, probably we need more of the kind of fiction that William Mowery has created in *Swift in the Night*, and more of the inquiring excitement regarding animal actions that Dr. Long evidences. Both these writers have gathered information with eagerness and have narrated it with zest. Both have a deep and informed sympathy—or "fellow-feeling" for the creatures of the wild. Both communicate this interest and sympathy to the readers. Thus they serve our great need for understanding and for the realization of the fact that we share with all the wild creatures our membership in the great life community of the Earth.

Whether the wild animals may be thought of at times as somewhat human, whether we men and women are at times best understood as animals—whether or not—it is certainly true that we all are fellow members of the same life community. William J. Long's tales, and his discourses, and William Byron Mowery's accounts, and his fiction, all help us to sense this community of interest and life.

Swift in the Night: And Other Tales of Field and Wood. By William Byron Mowery. New York: Coward-McCann, Inc. 1956. 254 pp. (5¼ by 8¼ in.) with 10 unidentified drawings in the text ascribed in the book's jacket to Walter W. Ferguson. \$3.75.

The Spirit of the Wild. By William J. Long. Garden City, N.Y.: Doubleday & Company. 1956. 256 pp. (5½ by 8¼ in.) with a foreword by the publishers, 20 unidentified drawings at chapter heads ascribed on the book's jacket to Ray Houlihan. \$4.

White-tailed Deer

The White-Tailed Deer in Wisconsin. By Burton L. Dahlberg and Ralph C. Guettinger. Madison, Wisconsin. 1956. Wisconsin Conservation Department. 282 pages. Illustrated. A study of deer and their management and needs in Wisconsin.



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Reviews

Forest and Woodland

By Stephen Collins. Mankato, Minnesota. 1956. Creative Educational Society. Illustrated. \$6.95.

This is one of a five-volume set brought out under the collective title of "The Community of Living Things." The other four volumes deal with Field and Meadow, Fresh and Salt Water, City Parks and Home Gardens, and The Desert. All five books have been prepared in cooperation with the National Audubon Society. Each book is a dramatic pictorial and textual introduction to the areas suggested by the titles. This immediate volume deals with types of forest, plant life in the forest, trees and their story, cold-blooded animals, warm-blooded animals and man and the forest. A page of excellent illustration faces a page of popular text. Necessarily a book taking in such a large ecological territory must be introductory, and that is the intention in these books. They stimulate an understanding of the forest and woodland community and encourage the seeing eye. From this introduction the interested individual will go on to a knowledge of other growing things and other creatures of the wooded land, wherever it may be.

Disney Books

Living Desert. By Marcel Ayme, Louis Bromfield, Albert Camus, Paul Espper, Julian Huxley, Jack Jungmeyer, Francois Mauriac and Andre Maurois. Translated by Victor Fitzmaurice. New York. 1956. Simon and Schuster. 72 pages. Illustrated in color. \$10.00.

African Lion. By James Algar. New York. 1956. Simon and Schuster. 75 pages. Illustrated in color from photographs by Alfred and Elma Milotte. \$10.00.

In these two beautiful books are presented, between covers, two of Walt Disney's True Life Adventures, originally notable, Oscar-winning triumphs on the motion picture screen. *Vanishing Prairie* is a third volume similarly translated from film to book, with text by the late Louis Bromfield, and, we assume follows the same format as the two above received for review. Both books were printed in Switzerland, and the beautifully reproduced color pictures are all tipped in. The popular text is

splendidly presented and typographically superior. Altogether these two books are as outstanding as publishing achievements as were their originals preeminent on the screen.

Man's Role in Changing the Face of the Earth

Edited by William L. Thomas, Jr. Chicago. 1956. University of Chicago Press. 1193 pages. Illustrated. \$12.50.

How has man affected the natural world about him for good and for bad? What has he done to this world in retrospect, how does this impact affect man and the world today, and what does his activity mean for the future? These are questions of vast importance and they are answered by a wide variety of authorities in this imposing symposium of information and opinion. Following three years of planning, an international gathering of scientists was held at Princeton, New Jersey, under the sponsorship of the Wenner-Gren Foundation. This meeting was devoted to interdisciplinary concern about the earth as it has been modified by human action. Out of this symposium comes this important volume, in the preparation of which the editor had the cooperation of Carl O. Sauer, Marston Bates and Lewis Mumford. There are three main parts of the book, dealing with retrospect, process and prospect. Sub-sections carry such titles as "Man's Tenure of the Earth," "Through the Corridors of Time," "Man's Effect on the Seas and Waters of the Land," "Alterations of Climatic Elements," "Slope and Soil Changes through Human Use," "Modification of Biotic Communities," "Ecology of Wastes," "Urban-Industrial Demands upon the Land," "Limits of Man and the Earth," and "The Role of Man."

Dipper of Copper Creek

By John and Jean George. New York. 1956. E. P. Dutton and Co. 184 pages. Illustrated by Jean George. \$3.50.

With this book this husband-wife team make it a sextet of Nature books, all of which are charmingly written, beautifully illustrated and full of accurate Nature information. In this book, in which the water ouzel is the central character, a fictional treatment has been adopted effectively, with young Doug as the leading human actor. This is a book about a bird and about the country in which it dwells.

Sketch Pad Out-of-Doors

By Clarence Tillenius. Winnipeg 2, Canada. 1956. The Country Guide. 98 pages. Illustrated by the author. \$1.00.

Many are acquainted with the splendid natural history illustrations of Clarence Tillenius, Canadian artist. Some of these have appeared in *Nature Magazine*. In this little book the artist does two things and does them well. He introduces the reader to the pleasures of sketching and gives him hints on how to enjoy this activity. At the same time the author-artist writes charmingly about outdoor experiences that are both memorable and sketchable. More and more people are finding a hobby in making a drawn record of their experiences afield. Mr. Tillenius will help the success of this hobby through this publication.

The World We Live In

By the Editorial Staff of Life and Lincoln Barnett. Text especially adapted by Jane Werner Watson. New York. 1956. Simon and Schuster. 216 pages. Illustrated in color. \$4.95.

The notable series of features under this title that appeared in the magazine *Life* was an outstanding contribution to knowledge of our planet and how it came to be what it is today. This material was two years in preparation and was gathered from the far corners of the world. Its illustrations in color were assigned to artists, or were derived from colored photographs. The result, as published in the magazine, was fascinating and informative. Now, in this immediate book, the original text has been splendidly adapted for younger readers, and the dramatic illustrations reproduced with this text. This is a volume that every youngster should have an opportunity to come to know.

Living off the Country

By Bradford Angier. Harrisburg, Pa. 1956. The Stackpole Company. 241 pages. \$5.00.

The author gives this book a subtitle of "How to Stay Alive in the Woods," and if you are planning any wilderness adventures you would do well to get acquainted with the valuable information in this book. The author divides its contents into four sections under sustenance, warmth, orientation and safety, and his first chapter is entitled "Every Necessity Is Free."

Things Maps Don't Tell Us

By Armin K. Lobeck. New York. 1956. The Macmillan Company. 159 pages. Illustrated by maps by the author. \$4.95.

Above the City of Ossining the Hudson River (not a flowing river but an estuary or arm of the ocean) widens into a large bay or inland sea called Haverstraw Bay or Tappan Zee, and north of Ossining a peninsula some two and one-half miles long extends out into the bay. It is on your road map and on other maps, but none of these answers the question of how this promontory got there. Nor would you find such maps revealing the histories of rivers, the whence of plateaus, the cause of fiords, or the source of isolated islands. Dr. Lobeck's interesting and valuable book answers many such questions. Professor of Geology at Columbia University from 1929 to 1954, when he retired, he makes maps come to life in dramatic terms through maps of his own drawing and through his clear and interesting text.

The Last Passenger

By James Ralph Johnson. New York. 1956. Macmillan. 116 pages. \$2.75.

In this charmingly written little book the author recreates the days when the passenger pigeon existed in great numbers. Through a young pigeon, whom he calls "Blue," Major Johnson creates a symbol of the decline of this numerous and gregarious bird and carries it to the moment of its extinction. He dislikes to think of the last bird dying in captivity in a zoo, and prefers to let Blue, in the wild, be the last of the passengers. Now and then there is a touch too much anthropomorphism for our taste, but this may be pardoned when one considers the symbolism involved. Although much has been written about the passing of the passenger pigeon, this author does the story differently and dramatically.

All about Snakes

By Bessie M. Hecht. New York. 1956. Random House. 143 pages. Illustrated by Rudolph Freund. \$1.95.

This is Number 16 in this series of "Allabout Books." Each one is, of course, an introduction to its special field, and is intended to intrigue the young reader's interest. Reptiles have a particular fascination for boys, and this book will serve to give them a general knowledge that may be followed up by more intensive study of the habits, structure and identification of the many species of snakes.

Yellowstone and Grand Teton Wildflowers

By Richard J. Shaw. 1956. Available from Museum Associations of both National Parks. \$1.00.

In this little spiral-bound guide forty-eight pictures are splendidly reproduced in full color, showing four dozen of the loveliest wildflowers to be found in these two National Parks. Opposite each picture brief popular text presents information about these flowers and where they are most likely to be seen growing.

The Story of Rocks

By Dorothy Shuttlesworth. New York. 1956. Garden City Books. 56 pages. Illustrated by Su Zan N. Swain. \$2.50.

Aimed at the 8 to 14 audience, this is an introduction to rocks designed to answer the questions of boys and girls who are intrigued by rocks they have collected. The colorful book gives these youngsters a background of rock information that adds significance to rocks and presents a picture of their origins.

A Treasury of the Dog

Edited by Ralph L. Woods. New York. 1956. G. P. Putnam's Sons. 432 pages. Illustrated by Lumen Martin Winter. \$5.00.

This is a canine anthology of a wide variety of writing, both prose and poetry, about dogs. The editor has included some of the noted dog stories that seem essential to any well-rounded collection, but has sought out other essays and verse not usually encountered. This book will delight any lover of dogs and should, therefore, have a wide audience.

California and the Southwest

Edited by Clifford M. Zier. New York. 1956. John Wiley and Sons. 376 pages. Illustrated. \$11.25.

Recognizing that California and the Southwest is perhaps the most rapidly developing and changing area anywhere, and certainly in the United States, the distinguished list of contributors to this economic geography bring us up to date with respect to this change. This is a textbook, but at the same time a sourcebook of information for anyone seeking data on this important area of our country. It is divided into two main parts, the first dealing with the physical characteristics of the region and the second with its cultural characteristics.

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Reviews

American Water and Game Birds

By Austin L. Rand. New York. 1956. E. P. Dutton and Company. 239 pages. Illustrated with color photographs by Allan D. Cruickshank, Eliot Porter, Helen Cruickshank, Cy La Tour, Eric Hosking and others. Silhouettes by Ugo Mochi. \$11.50.

With 127 photographs in full color, 40 photographs in black and white, and 35 bird silhouettes, this is a truly beautiful book. Put with these the text by the author, who is Chief Curator of Zoology of the Chicago Natural History Museum, and the combination is a notable addition to the literature of ornithology. Here is no field guide, for it is a large book for the library table. There are thirty-five chapters covering, in order, loons, grebes, albatrosses, shearwaters, petrels and fulmars, storm petrels, tropic-birds, pelicans, gannets and boobies, cormorants, anhingas or water-turkeys, frigate or man-o'-war birds, herons and bitterns, storks and wood ibis, ibis and spoonbills, flamingos, swans, geese and ducks, chachalacas, ptarmigan and grouse, quail, partridges and pheasants, turkeys, cranes, limpkins, rails, gallinules and coots, jacanas, sandpiper family, plovers, turnstones and surf-birds, oyster-catchers, stilts and avocets, phalaropes, gulls, terns, skimmers, jaegers and skuas, the auk family, and pigeons and doves. The text is popular and as enjoyable to read as it is informative.

Rattlesnakes

Their Habits, Life Histories and Influence on Mankind. By Laurence M. Klauber. Berkeley, California. 1956. University of California Press. 1476 pages in two volumes. Illustrated. \$17.50 the set.

The author of this outstanding work is an engineer by profession and a herpetologist by avocation. For thirty-five years he has acted as a consultant to the Curator of Reptiles of the San Diego Zoological Society, under whose auspices these two fine volumes are published. Of course, Mr. Klauber's work is based upon long and extensive field work, laboratory study of more than 12,000 rattlesnake specimens and exhaustive research. The net result would appear to be without question the final word on rattlesnakes for a long time to come. Of vast importance for

reference and to the student of reptiles, Mr. Klauber's text invites browsing. We are interested to learn, for example, that he regards the western diamondback rattler as the quickest to anger, with the eastern diamondback a close second in shortness of temper. There are eighteen chapters in the two volumes, ranging from Paleontology and Phylogeny to chapters on Indians and Rattlesnakes and Myths, Folklore, and Tall Tales. There is, of course, an excellent bibliography. Certain it must be that Mr. Klauber has overlooked nothing worthy of note in thus giving us the fruit of his long and notably successful pursuit of an avocation. Few can point to more abundant fruit. R.W.W.

Hawks, Owls and Wildlife

By Frank and John Craighead. Harrisburg, Pa. 1956. The Stackpole Company. 443 pages. Color frontispiece by Walter A. Weber; drawings by Jean Craighead George; photographs by the authors. \$7.50.

In this Wildlife Management Institute publication two biologists present the results of extensive studies of the relationship of predatory hawks and owls to other wildlife. Thus they explore an area that has been signalized by prejudices and misinformation for a long, long time. Persecution of hawks and owls resulted, and still continues despite enlightened biological knowledge and public education. In this important volume the significance of raptorial predation is brought into its proper perspective in the ecology of the wild. This is an important work.

Briefly Noted

The Great Migrations. By Georges Blond. New York. 1956. The Macmillan Company. 192 pages. \$4.00. Fascinating story of the drama of typical animal migrations such as those of geese, herring, salmon, bison, locusts, eels and lemmings.

Exploring the Universe. By Roy A. Gallant. New York. 1956. Garden City Books. 62 pages. Illustrated in color by Lowell Hess. \$2.00. The Story of the universe told simply and effectively in clear text and dramatic illustration.

There Once Was A Puffin. By Florence Page Jaques. Sanbornville, N. H. 1956. Wake-Brook House. Illustrated by Francis Lee Jaques. \$2.00. A charming little book of several "nonsense verses" for young readers.

Mountain Flowers. By John Raven and Max Walters. New York. 1956. The Macmillan Company. 240 pages. Illustrated in color and black and white. \$5.00. A book of the wild flowers of the mountains of Britain.

Challenge of the Andes. By C. G. Egeler and T. de Booy. New York. 1956. David McKay Company. 204 pages. Illustrated. \$4.50. The story of the adventurous conquest of Mount Huantsan.

Arranging African Violets. By Emily Stuebing. New York. 1956. Hearthside Press. 116 pages. Illustrated. \$2.95. Practical advice on effective arrangement of these popular house plants.

Flower Show Themes and Classes. By Dorothy Biddle. New York. 1956. Hearthside Press. 64 pages. Illustrated. \$1.95. A book for that considerable army of flower-arrangers.

Foliage Arrangements. By Emma Hodgkinson Cyphers. New York. 1956. Hearthside Press. 126 pages. Illustrated. \$3.50. How to get the best results with foliage as the center of the arrangement plan.

Let's Take A Trip to A Newspaper. By Laura Sootin. New York. 1956. Illustrated by Sidney Quinn. \$1.75. Introduction to newspaper production for the younger reader.

Soil Fertility and Fertilizers. By Samuel L. Tisdale and Werner L. Nelson. New York. 1956. The Macmillan Company. 430 pages. \$7.75. A textbook presenting some of the fundamental concepts in this field for students of agriculture at the junior and senior college levels.

Treasury of Snake Lore. Edited by Brandt Aymar. New York. 1956. Greenberg. 400 pages. \$5.00. An anthology of snake literature in mythology, fable, story, essay, poetry, drama, religion and personal adventure.

Mountaineering. By Ronald W. Clark. New York. 1956. Macmillan. Illustrated. \$5.95. A dramatic and fascinating pictorial history of mountaineering with 350 pictures and descriptive text.

Dictionary of Anthropology. By Charles Winick. New York. 1956. Philosophical Library. 579 pages. \$10.00. Dictionary of the specialized vocabulary of archeology, linguistics and cultural and physical anthropology.

Contents noted

BY THE EDITOR

"TOGETHER WE MAKE TOMORROW" is the slogan that the Campfire Girls have adopted for the celebration, during the week of March 17 to 24, of the forty-seventh anniversary of the founding of their organization. They are convinced that there can still be pioneers, and the more than 400,000 members of this organization in some 3000 communities are setting out to prove it. In adopting such a slogan, and setting such goals, the Campfire Girls have adopted aims and charted a course that could well be followed by all peoples and all nations. At the present moment togetherness for tomorrow does not seem to be a world concept, but it is encouraging to see that this fine youth organization has more vision than many in high places.

DR. WILLIAM M. MANN'S RETIREMENT after thirty-one years as Director of the National Zoological Park in the Nation's Capital was dictated by nothing but the inexorable march of the years and the provisions of the law. At three score and ten Bill Mann is certainly entitled to relief from the pressures of administering one of the world's greatest zoos, a responsibility he has carried since 1925. Operated under the Smithsonian Institution, this zoo is dependent upon Congress for appropriations. Dr. Mann had a way with legislators, as is evidenced by the approval and erection of four modern exhibition buildings, and the planning of others. These are sorely needed, including a habitable headquarters building. Bill Mann is, also, an accomplished animal trader, as well as eminent zoologist and authority on ants, and his abilities will not be lost to the Smithsonian for he will continue as Honorary Research Associate, the Institution's highest honorary scientific designation. Perhaps Bill's retirement will refocus attention on his fascinating autobiography—*Ant Hill Odyssey*—one of the most entertaining books in our experience.

"VENISON ON EVERY PLATE" is the suggestion for the solution of the problem of the future of the Key Deer advanced by the editor of *Florida Keys Record*, published weekly at Marathon, Florida. The editor would get rid of the deer, and, therefore, the problem, and would form an organization of Monroe County residents known as "SPAM," which means "Society for the Prevention of Annoying Meddlers." This is a clear indication of the kind of thinking that is to be encountered in further attempts to provide some sort of refuge and protection for the remaining small deer.

"BILLIONS FOR ROADS BUT NOT ONE CENT FOR BILLBOARDS" is the rallying cry for the taxpayers who will foot the bill for the vast new highway program, according to the suggestion of Inez Robb, columnist for the *New York World-Telegram and Sun*. She points out that the road program "provides a ready-made billion-dollar gift bonanza for the billboard people, and they will fight tooth and nail for it. . . The billboarders are crying aloud for freedom to deface one of the world's most lovely nations. They are beating their respective breasts and piteously crying aloud for the privilege of robbing you and me of our national heritage of beauty." Miss Robb is, unfortunately, correct that there is little or no safeguard against parasitism of this tremendous public investment by the outdoor advertising interests. She might have added that, besides defacement, billboards along high-speed highways constitute a dangerous distraction of attention and are a menace to safety. Attempts to have the billboard threat recognized in Federal legislation was unsuccessful, no doubt largely due to the billboard lobby. The States, however, still have the opportunity to act, as was recently proposed in a resolution by the Pennsylvania Roadside Council. The Council urged that the State take a "scenic easement" on at least 1000 feet from the edge of the right-of-way on both sides of the highway at the time the right-of-way is procured. Rest assured the billboard interests will be on hand to defeat any such proposals, but the tax-paying public has the right of expression, also, through their elected representatives in State legislatures.

WHY LANDOWNERS POST LAND is being investigated through a survey being conducted in Massachusetts. A questionnaire has been sent to owners to discover whether they post their property against hunting and fishing, how much land they have, how much they post, what water area there is on the property, what they post the land against, and the chief reasons for such posting. This reflects, of course, rising concern on the part of gunners who find "No Hunting" signs blossoming on increasing acreage. Of course, the basic reason for such prohibition of entry lies in the indifference, incompetence and downright vandalism of too large a percentage of licensed gunners. And it is just possible, too, that more and more people have discovered that they like to have the wildlife around in their woods and fields.

R.W.W.

Mother Maguey—

Source of food, drink, shelter and clothing,

to the Otomi Indians of Mexico



This is the bleak, desolate country of the Otomi Indians in the Valley of the Mezquital. The three women dog-trotting home are carrying pigskins filled with *agua miel*, product of "mother maguey," which sustains the natives, serving as both food and beverage.

FOR several centuries the maguey has meant life, of sorts, to the 65,000 Otomi Indians who live on the arid lands in Mexico's Valley of the Mezquital. They depend on it for food, "water," a good bit of their shelter, and some of their clothing.

No wonder the maguey is sometimes called the "miracle plant," for it largely supports an entire Indian nation, one of the largest ethnic groups in Mexico, although one said to comprise the poorest people on the American continent. There are more than 2,700,000 magueys growing in the valley named after the tough little mesquite tree, associate of the maguey, or agave. Within easy reach of every man's patch of maguey is a hovel from which he emerges every morning, with the regularity of a farmer going out to his cows, to "milk" Mother Maguey so that his family may exist another day.

The Valley of the Mezquital, with its mountains as well as its desert, is traversed by the Pan-American Highway and lies in the State of Hidalgo. Almost the exact hub of the Otomi country is the town of Ixmiquilpan, one hundred miles north of Mexico City. Fanning out from it in all directions on the desert are the villages of the Indians, who were pushed north 600 years ago to find a home on land no one else in his right mind would covet. Here they have sought, and found, isolation.

Due to the lack of rain, a corn crop may be depended

upon only once in eight to ten years and thus the "milk" of the maguey is the chief article of diet, supplemented by *tortillas*, when corn is to be had. Occasionally a family may boast of red chile peppers in their *tortillas*, but not often, and meat is a rarity reserved for funerals and weddings of the more prosperous Indians. There is no milk, of course, and babies suck the product of the maguey from their mother's fingers, school children drink it, and adults consume on the average of two quarts of it a day. Thus this desert plant yields drink as well as food, for virtually all of the Otomi villages lack water a good share of the time.

To be supported by maguey alone, a man would need one hundred plants in production, and since the plants do not yield *agua miel* until they reach maturity at the age of seven, a patch of around seven hundred magueys would be required to have one hundred producing. Such a planting would demand something like eight acres, for the magueys are spaced about two and one-half yards apart. When "milking" of a maguey begins, at its maturity, the yield is about two quarts of "honey water" a day for three months during the winter, if it is tapped then, or for four months during spring and summer. And that is the end of it, so far as *agua miel* is concerned—a wait of seven years for a production period of three or four months.

By W. J. GRANBERG

Photographs by the Author



Because they are tapped earlier, few magueys are permitted to reach maturity as this plant did. The stalk is about thirty feet tall. Blossoms and tender portions of the stalk are eaten, as are the worms in the huge leaves.

Only a few Otomis have as many as 700 plants, and most of them struggle along on less than half that many. However, those who do have one hundred plants producing every year can count on 18,000 quarts of liquid, beyond their own needs, which can be sold at forty centavos a quart, retail. This would mean a yearly gross of 6800 pesos, or about \$550. This is far more than an Otomi village schoolteacher earns at 350 pesos a month.

Although the fermented milk of the maguey, or *pulque*, contains all the minerals, vitamins and proteins neces-



Aqua miel, or honey water, is sucked twice daily from the hollowed-out cavity in the heart of the maguey. The liquid is transferred from gourd to jug to carry home. Fermented, it becomes *pulque*. The agave yields *agua miel* three to four months when it reaches the age of seven, and then dies.

sary to a diet on which people may survive, this milky-looking fluid—which smells like stale beer—has approximately the same alcoholic content as beer. As though to be doubly sure of survival, many people, including children, drink too much of it, with the inevitable result of intoxication, or stupefaction.

Gathering *agua miel* is like sipping cider through a straw. It begins when the tips of the heavy, fleshy, spiny-margined, thorn-pointed leaves turn slightly inward as a sign of maturity. If left alone, the maguey will bloom at the age of ten years or so. At that time, cutting away the huge stalk will wound the plant and cause *agua miel* to flow. Rather than wait that long, however, the plant is wounded artificially by punching a hole in the base of the trunk with an iron bar and hollowing out a cavity, or collection bowl, with a heavy, iron spoon. The scrapings that are removed, called *corozon*, or heart, are carried home for eating. Roasted, they have a honey-like flavor.

The honey water is gathered by sucking it up into a huge gourd and then transferring it to a jug, which is



The nopal cactus in the foreground produces food for the Otomis, just as does the patch of magueys in the distance. The fruit of the nopal, called *tuna*, or prickly pear, is eaten, as are the leaves, which are stripped of thorns and diced.

This Otomi woman is sucking *agua miel* from the cavity in this maguey. The scrapings, which are removed with an iron spoon to keep the bowl open, are called *corozon*, or heart. They are eaten both raw and roasted. Using a maguey leaf as a tray, the woman has gathered enough *corozon* to make a meal.



slung from a rope on the milker's back. When the cavity is sucked dry, a heavy rock is placed over it to prevent water-hungry animals from pirating a drink. An Otomi makes the rounds of his magueys like a farmer going from cow to cow, and usually can carry the day's output in one large jug.

Agua miel is a good enough drink for a day or two, but then it begins to sour. Before such a catastrophe, however, it is converted to *pulque*. This is done by adding a "starter," or yeast, from a stock of strong *pulque* kept on hand for that purpose. It is called *pie*—foot—or *madre de pulque*—mother of *pulque*. This "starter" is similar to that which the Alaskan sourdough keeps on hand for raising his next batch of bread.

Once started, fermentation continues, even after it is swallowed. It acts as a bacteria culture, too, so that germs collected by drinking from a mug that has not been washed for several months or so, if ever, continue to be supported in the drinker's stomach and intestinal tract.

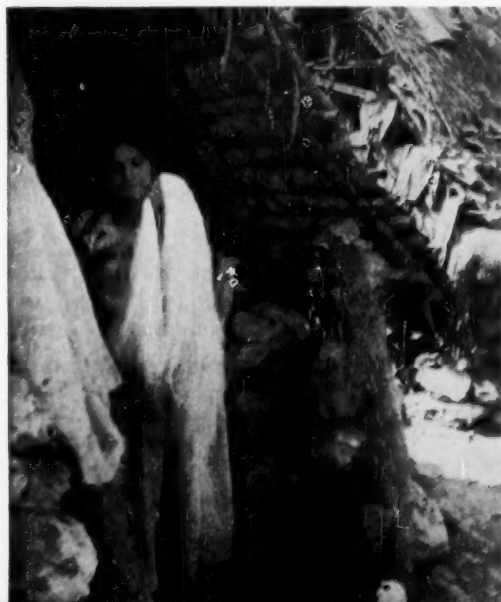
Pulque and *corozon* are not the only sustenance yielded by the maguey. The leaves, rising from the earth in a huge rosette, four to six feet long and each around seven inches wide, hold tasty worms, *gusanos*, which are considered a delicacy. The occasional maguey that is permitted to live out its span and dies

a natural death produces flowers on a stalk that may be from twenty to forty feet tall. Much of this stem is tender and edible, while the tough portions are fed to the few pigs that may be in the area. The flowers themselves, two to three inches across, yellowish-green and borne on horizontal branches, are counted a dish worth waiting for.

The trunk of the maguey is used for firewood, while its strong fibers are utilized to make brushes and ropes. The thin skin of the leaf is used to dress wounds, while each one carries a sharp thorn needle at its tip, already threaded by Nature with a strong fiber thread. This same leaf is important in Otomi housing activity, for it serves well as a roof, laid like shingles. Also it serves as walls when leaves are placed against a framework of light poles. The pulpy residue in the leaf, left when the fibre is extracted, is called *xixi* in Otomi and *shishi* in Spanish. This serves as an excellent soap, assuming there is water to go with it.

Water, once the food problem is solved by the liquid and other by-products of the *maguey*, is the big problem of the Otomi. Most villages have a *jaguey*, or water hole, which has water from four to eight months out of the year. Animals as well as humans use it, and it becomes so polluted it means certain death, ultimately, for people who drink it. Other villages can boast of a concrete water tank built by a government agency, Patrimonio Indigena del Valle del Mezquital. This tank ostensibly is filled two or three times a week. This practice is honored in the breach, however, and the tanks, *pilas*, often are empty. This means folks who trudge a mile or more in vain for water must depend upon the contaminated *jaguey* water, if there is any, or turn to their old standby, *pulque*. Three villages in the Mezquital actually have no water at all, pond or tank, and there livestock as well as natives must depend upon Mother Maguey for a substitute. To live with the Otomis is to appreciate water.

Preparatory to spinning the *ixtle*, fiber of the maguey leaf, this Indian girl has washed and dried it. Formerly used in making clothing, *ixtle* now is woven into *ayates*, a burlap-type cloth in which everything from babies to a pigskin of *pulque* is carried.



Without maguey it is obvious that the Otomis never would have survived in the Mezquital, or, indeed, could even have paused there long enough to build a hut. The estimated 7,000,000 quarts of fluid provided by the magueys means not only food, but drink. In addition to providing sustenance, shelter, soap and fuel, the maguey plays a vital part in the economy of the Indians by yielding a fibre called *ixtle* (pronounced ease-lay) from which *ayates*, or carrying cloths, and a few items of wearing apparel are made. Virtually every Otomi, man, woman or child, walking along the road, or passing the time of day with his neighbor, carries a wad of *ixtle* over his left shoulder and twirls a *malacatl* (*huso* in Spanish), on which he spins it. The spindle is twirled with the right hand, while the fiber is fed to it with the left hand as it is torn away from the mass over the spinner's shoulder by his teeth.

The fiber is obtained by cutting the huge leaves from the maguey, placing them on a flat rock and pounding them with a crude wooden mallet to break up the skin and pulp. Next, the mass of pulp and fiber is laid over a rack, or board, and the former is flayed away with a piece of wood having slightly rounded edges to avoid cutting the fiber. Shaken out and dried, the *ixtle* looks like a clump of blond hair, and is ready for spinning.

Children know how to spin by the time they are six years old, and keep it up until they die, for a good part of any Otomi's income depends upon *ixtle*. The thread that is spun by twirling the spindle once was used for making all clothing. Today, however, its use for weaving clothing is confined largely to the making of a rude *reboza*, or stole, *serape*, or rough blouse, and occasionally a skirt.

The most important use of *ixtle* is in weaving the *ayates*, the carrying cloths sold in every market. These are used to carry everything from a pigskin of *pulque* to a baby. They serve an Otomi from cradle to the grave,

This Indian girl is weaving an *ayate*, or carrying cloth, from the fiber of the maguey. These cloths sell for three pesos and are important in the economy of the Otomis. The loom and method of weaving have not changed throughout the centuries.



for an infant is carried in one, often sleeps in one, grows up to use it as a carrying cloth, and knows all along it will be his winding sheet in death.

The Otomis have a slight culture, but what they do have they stay with, such as the method of weaving *ayates*. A Codex Florentino sketch shows a woman weaving a carrying cloth, and the drawing reveals that the method in use today is identical with the process of centuries ago. As in the sketch, Otomi women tie one end of their crude loom to a tree, or post, and secure the other end to their waist by means of a fiber rope. Today's entire spinning and weaving process is identical with that of ages ago.

An industrious woman can turn out a half-dozen *ayates* a day and still find time to hunt firewood and make *tortillas*. These cloths sell for three pesos, or 25 cents, U.S., which means a family having enough maguey to assure them a continuous supply of fiber is in big business. Unfortunately, however, few families are in position to grow sufficient magueys to reach that enviable

state, either because they lack sufficient land, or the money to finance annual plantings.

During the last week in April, villages that are accessible by truck are visited by enterprising dealers in magueys. They sell two-year-old plants for one *peso* and ten *centavos*, or about ten cents, American. Ordinarily, one woman near a central location in the community will be named as *duena de maguey*, or the person in charge of keeping an eye on the plants. Planting is done during the first week in May. Although Mother Maguey may be grown from seed, to do so would tie up more land than is feasible, and the rootless two-year-olds, which seem to grow in any kind of soil, are set out like bulbs throughout Otomi land once the light rains of May begin.

So this agave is the "miracle plant" of the Mezquital, Mother Maguey, who brings food and fluid to the abject Otomis. It means life to the oldest people in Mexico, a group that traces back to before the Aztecs; a people who have not much more today than they did then.

Dinosaur Rock

By JOHN D. KENDIG

FOR MANY years I have enjoyed exploring the rocky lands in the hills of northwestern Lancaster County, Pennsylvania. Typical round-edged rocks occur there as scattered boulders or appear in great jumbled heaps and fields, forming rugged drainage slopes and "Devil's Potato Patches." Down along the Susquehanna River, near Falmouth, they form a wild tangle known as the "Governor's Stables." Farther on they crop out in the bed of the river, and are best seen when the water is low, exposing acres of oddly sculptured and pot-holed rocks.

But certainly the most individually impressive of such boulders is one that rises alone on the top of a Lebanon County hill, just over the Lancaster County line and north of the Pennsylvania Turnpike, about five miles west of the Lancaster-Lebanon interchange. It stands thirty feet high in a stand of young hardwoods, has a broad, shoulder-like base that narrows up into a columnar neck, topped off with a long flat headpiece, complete with eye and other features.

Locally it has been known as the "balanced rock," and one side is so seemingly off balance that it is difficult to see how it remains standing. Naturalist and former college professor, Dr. Herbert H. Beck of Franklin and Marshall, at nearby Lancaster, when brought there, promptly named it "Dinosaur Rock."

Apparently it is a form of igneous rock that, as a molten mass, seeped up to near the earth's surface, then cooled to diabase, which has been gradually exposed and shaped by the steadily working forces of erosion and weathering. Now it is a regular scheduled stop on most



PHOTOGRAPH BY THE AUTHOR

geology field trips from the college, which are held for students and other interested people.

Whether seen through the screen of summer hardwood foliage, or in the glorious golden glow of autumn's tulip trees and black birch, or on dark winter days when it wears an amusing cap of snow, or in early spring when the first hepaticas push up through the leafy mold, Dinosaur Rock stands indomitable and seemingly unchanged.





This "perching" erratic was gently dropped some seventeen thousand years ago on a barren shoulder of the South Bubble in Acadia National Park. Although seemingly poised for a headlong rush into the valley below, the boulder is quite firm in its position.

*There is a fascinating story in
the past of*

Rocks that Left Home

*Photographs courtesy of the National Park Service
and the author*

By PAUL MASON TILDEN

THE ADVANCE of the last great ice sheet over much of the northern portion of North America—the Wisconsin advance of the Pleistocene Ice Age—did more than alter the face of the land. It was subtly to touch and affect the lives, the habits and the history of the people who were to come to occupy its abandoned territory, some fifteen or twenty thousand years later.

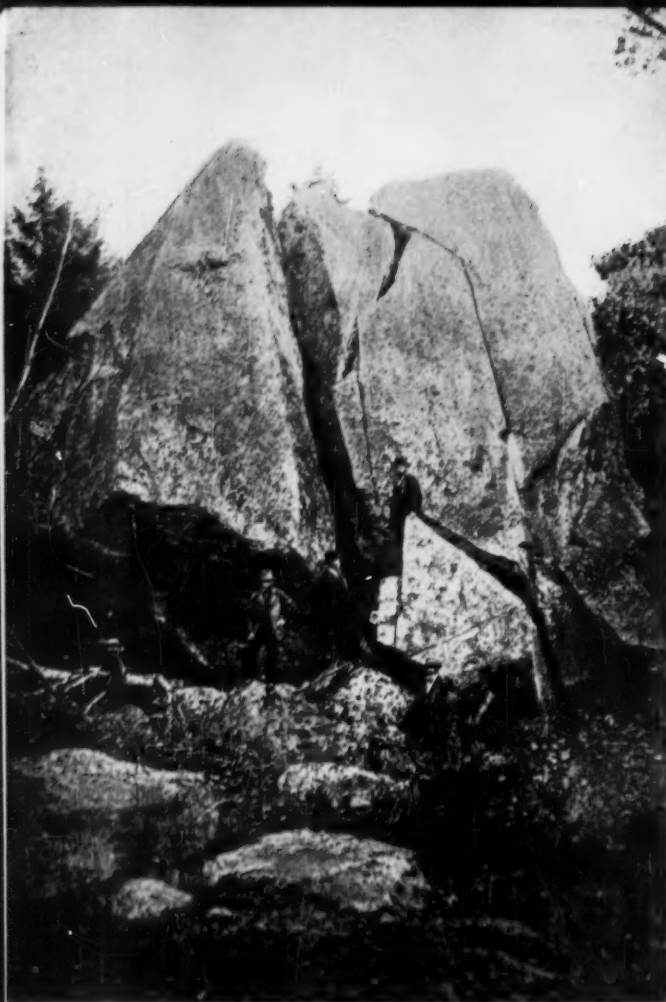
The glacial ice determined, of course, the kind of life that would be lived on the land it uncovered. New rivers were formed. Glacial bogs and ponds were left strewn about in haphazard fashion. Old lakes were deepened, or perhaps eliminated entirely. The ice even dictated what portions of land the farmer-to-come could economically plant, and what portions he should allow to remain in pasture and woodland.

The line of demarcation between glaciated and unglaciated land in the United States undulates westerly from the eastern tip of Long Island far out into the Pacific Northwest, paralleling roughly the courses of the modern Ohio and Missouri River valleys. Few persons born and brought up north of this line are conscious

of the difference between themselves and their brothers to the south. But let them cross the line, and they suffer from a queer nostalgia. There is something missing. They seldom know what that something is; but the moraines, the kames, the drumlins and the erratic boulders are not there, and the land somehow seems very different.

The glacial ice has entered into the daily life, the legend and history, and even the simple problems of creating homes, not only of our prehistoric Indians but of inhabitants down to the present day. It has created events and stories impossible in unglaciated lands. The Great Stone Face, immortalized by Nathaniel Hawthorne, is merely a case of the plucking of a mountain-side by flowing ice. And you may recall the story of the young New Englander who joined the Continental Army in order to escape the back-breaking drudgery of laying up stone walls?

Riven from the mountainsides and carried either within or on the back of the great ice-field were innumerable boulders of many shapes and sizes. Some of these were



An escaped lunatic played the leading role in naming the Churchill Rock in the town of Nottingham, New Hampshire. The photograph is a reproduction of an old-time heliotype.

of majestic proportions. They encumbered the lands. Some of them traveled long distances, like the jasper boulders that originated north of Lake Superior and were dropped just south of what is now the Ohio River.

Man has a way of utilizing whatever Nature has placed at hand; and the glacial boulders are no exception.

The Franconia Notch of New Hampshire's White Mountains is not a pleasant place in which to be caught in a full-scale blizzard, even in modern days. Despite the fine highway and the "blue angels"—below-zero patrol cars—a breakdown can still lead to discomfort, if nothing worse.

A Mr. Boise, traveling north through the Notch in the early eighteen hundreds, had neither a good highway nor a safety patrol to comfort him. He was on horseback riding over a road that was hardly more than a trail hacked through the

A single glacial erratic furnished all the necessary stone for the home of John Sullivan Wells of Lancaster, New Hampshire, a hundred and thirty years ago. At the rate of one round trip a day, the granite was brought by ox-team from the village of Maidstone, Vermont, up the Connecticut River from Lancaster.

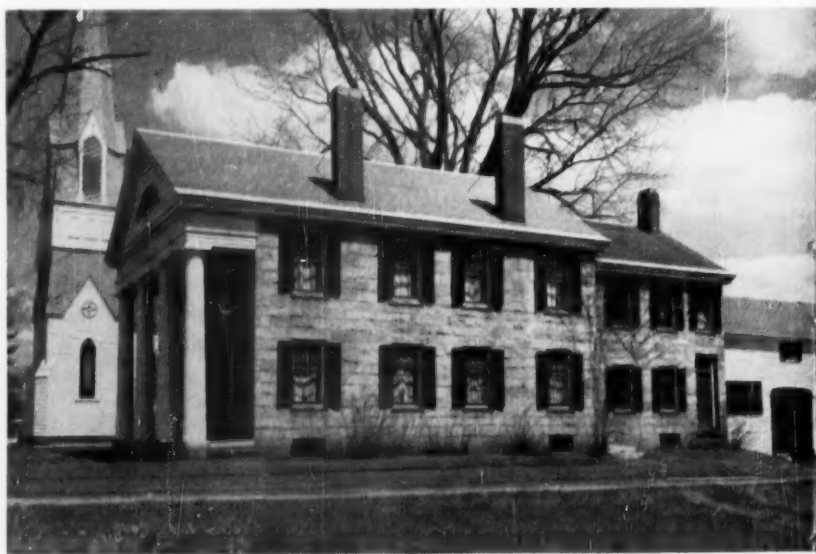
wilderness. His destination was the tiny mountain village of Franconia, some miles to the northwest. In the Notch he was overtaken by a mid-winter blizzard. With the temperature below zero and the snow driving horizontally through the ancient forest of the narrow valley floor, Boise must have concluded that the moment for an important decision had arrived.

Just off the road to his right, a great boulder loomed through the veil of snow. Boise urged his horse to it. Dismounting, he proceeded to kill and skin the animal. He then wrapped himself in the folds of the warm hide, and wedged himself under the deep overhang of the boulder. The next day a search party discovered him there, still alive, and extracted the hardy traveler from his armor of solidly frozen horsehide.

This friendly boulder is still commemorated as Boise Rock, in the Franconia Notch State Reservation. The unromantic geologist would tell you that Boise Rock is a glacial erratic. A bigger than average specimen, surely, but still just one of many millions scattered throughout the glaciated northern third of the nation.

Centuries before the arrival of the white man on the shores of the New World, a compact group of large erratics kept a close watch on the quarrying operations of the American Plains Indians at "the place of the red pipe-stone"—now Pipestone National Monument—near the city of Pipestone, Minnesota. From this curious soft red stone, later named catlinite, the important Indian ceremonial pipe was fashioned.

Incidentally, George Catlin, the traveler-painter for whom the pipestone was named, visited the quarries in 1836 and sent a sample fragment to a Boston mineralogist



The Bristol or Lord's Prayer Rock at Bristol, Vermont, was inscribed by a physician to soothe the painful memories of childhood.

for analysis. The Boston mineralogist pronounced it a new mineral, although we now know that catlinite is not a mineral at all but is similar in composition to an indurated clay. Our modern geologists are somewhat puzzled, however, as to just how the catlinite at Pipestone was formed as a thin seam in a bed of massive quartzite, like a slice of luncheon-meat in a huge sandwich.

While Indian legend concerning the pipestone quarry and its surroundings varies in detail from tribe to tribe, it is pretty much in agreement on one point; that the guardian spirits of the place made their abode beneath the group of glacial boulders. Before the brave could quarry and carry away his precious bits of pipestone, humble supplication and offerings of tobacco to the spirits were necessary.

One would naturally expect to find the greatest abundance of erratics in places where the ice sheet had plenty of upthrust bedrock to pluck away. In the New England States, erratics occur in great swarms at many places; and now and then we come on an individual, sitting in woodland or old pasture, that appears to have had a segment bitten from it. Freezing water, of course, will get into cracks and fractures of a boulder and wedge out pieces. But freezing water has never been known to leave a line of drill marks on the broken edge of the rock. Earlier settlers of New England lacked such conveniences as quarries, so when a man needed a good solid door-step, or some underpinning for a new barn, he took a stone drill and sledge to the nearest suitable erratic and hewed out what he wanted.



Now and then a giant is found among the lesser fry, like a whale in a school of minnows. A hundred and thirty years ago, a flourishing lawyer in the village of Lancaster, New Hampshire, decided to build a stone house. Every slab of granite that went into the house was cut from a single glacial boulder found at Maidstone, Vermont, a few miles up the Connecticut River.

Just east of the pleasant hamlet of Bristol, Vermont, where the highway strikes through a break in the precipitous western front of the Green Mountain range, there is a great glacial erratic on which is engraved the Lord's Prayer. Reasonably enough, it is known as the Lord's Prayer Rock. But there is no visible explanation for this piece of handiwork, and curious tourists who stop for a closer look are naturally perplexed.

As a rather sensitive youngster growing up in Bristol, Joseph Greene was all too familiar with the blasphemy of the teamsters who whipped their horses up the long grade of the highway east of town. Possibly the teamsters of Bristol were more vivid of language than their brothers elsewhere. Whether or not, Joseph Greene carried the memory of the bad language with him, even after he had become a successful physician in Buffalo. So, during one of his visits to his childhood home of Bristol, he ordered that the Lord's Prayer be engraved on the boulder by the side of the highway that had so offended him.

There is a glacial erratic in the town of Nottingham, New Hampshire, that would



Beneath this group of glacial erratics at Pipestone National Monument in Minnesota lived the guardian spirits of the sacred pipestone quarry, according to the traditions of our American Plains Indians.

The deep overhang of glacial Boise Rock and a faithful horse collaborated to save the life of a hardy traveler in the White Mountains of New Hampshire.



tip a rather larger-than-ordinary set of scales at about six thousand tons. It acquired its name in a rather unorthodox manner. It appears that a mentally disturbed man by the name of Churchill, being detained in the neighborhood of Nottingham, escaped his keepers and made off through the woods. A pursuit party was organized, and the demented man was finally discovered perched atop this great glacial fortress. Considering the near-vertical sides of the boulder, Churchill had performed a climbing feat of no mean proportions. The question arose as to how best bring him down, keeping an eye on minimum casualties. After several fruitless attempts by the party to scale the boulder, someone suggested that a tree be felled across its top to act as a bridge. This was done, and the occupant of the summit was taken safely into custody. Churchill Rock had thus been christened.

At about the same time, Benjamin Prescott, Governor of New Hampshire, heard stories about glacial boulders of fabulous size in neighboring States. Feeling that the honor of the Granite State was impaired by such reports, the Governor personally led an expedition into the field to search for an erratic that might qualify as the Biggest Boulder Ever Discovered. The results of his investigation were not apparently wholly satisfactory. However, some years after the passing of Governor Prescott, a real find was made in the township of Madison—a glacial boulder that is believed to be the largest discovered to the present time. It is a single block of granite measuring eighty-three feet long, thirty-seven wide, and twenty-three high, with an estimated weight of something more than seven and a half thousand tons. No collector's item, that!

Glacial erratics used as historical or commemorative

markers are a familiar sight in the public parks of the north. Where the ice sheet was most accommodating, the boulders were dropped in the right places, ready to be inscribed, or smoothed for a bronze tablet. The less-favored park managements are constrained to scurry around and bring one in, which is easily done in most glaciated areas.

Perhaps the most famous of the commemorative erratics sits astride the line drawn up by the American minutemen April 17, 1775, on what is now Lexington Green in the village of Lexington, Massachusetts. On this boulder are engraved the fateful words of Captain Parker: *"Stand Your Ground—Don't Fire Unless Fired Upon—But If They Mean To Have a War—Let it Begin Here."*

High up on one of the sloping granite shoulders of the South Bubble in Acadia National Park perches a great round boulder. If you should climb up to this rock—as many visitors do every year—you can easily see that the boulder did not originate from the bedrock of the mountain. From the valley below, there appears to be no good reason for it to stay there. As you look, you almost expect to see it start plunging down the bare upper brow of the South Bubble. Actually, there is little chance of such a happening, although possibly an earthquake of the first magnitude might turn the trick.

To thousands of visitors from unglaciated parts of our country this boulder, silhouetted darkly against the skyline, is a first experience with the substance of the phenomenon we call the great continental ice sheet. Even those who have been brought up among the glacial relics of the north sometimes leave Acadia with the impression that this child of the ice is waiting for something—possibly the return of its parent. Who can tell?



Laboratory buildings of the Canal Zone Biological Area on Barro Colorado Island as seen from Gatun Lake.

Barro Colorado Island is truly a

Scientists' Treasure Chest

By E. JOHN LONG

PHOTOGRAPHS COURTESY OF EASTMAN KODAK COMPANY



Dr. James Zetek, Curator of the station for the past ten years but now retired.

IT WAS in July, 1946, that the President of the United States, in the process of eliminating alphabet agencies and combining related government functions, transferred the CZBA, or Canal Zone Biological Area, from the control of a special board—which included the Secretaries of War, Agriculture and Interior, as well as others—to the Smithsonian Institution.

It was a logical switch. The Smithsonian's staff not only includes several of the nation's eminent biologists, in addition to other scientists, but the Institution also operates the National Zoological Park, or Washington zoo.

The Canal Zone Biological Area is itself a kind of zoo, *in reverse*. That is, human beings dwell in a clearing near the center of it (where they are securely locked in at night), while all around them thousands of varieties of wild mammals, reptiles, insects, birds and other fauna live under the natural conditions of a steamy tropical jungle.

Of course, they are not quite "natural conditions," for CZBA is unique among scientific reservations in that it is an island that once was just another heavily foliated hilltop. It became an island shortly after the rushing Chagres River was dammed, in 1908, to form Gatun Lake for the Panama Canal.

As the water level slowly climbed in the next four years, a host of living things moved before the rising tide. Denizens of jungle lowlands for miles around tried to find new homes in the already crowded hilltop that was to become Barro Colorado Island. Fierce struggles for survival ensued, eliminating surplus creatures that could not swim or fly away, as well as those unable to obtain enough food to sustain life. It was, in fact, the great flood of Biblical times in miniature, with Barro Colorado's final 3600 above-water acres playing the role of a tropical Noah's Ark.

By 1923 a number of eminent scientists and naturalists came to the conclusion that this patch of concentrated flora and fauna, absolutely unique

in the world, should be set aside for scientific purposes. They formed an organization called the Institute for Research in Tropical America. Its spokesman, Dr. James Zetek, a U.S. Department of Agriculture entomologist working on malaria control, took the suggestion to the Governor of the Canal Zone, General J. J. Morrow. Governor Morrow liked the idea. He promptly declared Barro Colorado to be a biological preserve, and made Dr. Zetek its curator, a post he held until last June, when he retired and was succeeded by Dr. Carl B. Koford. Dr. Ignacio Molino, of Panama, was appointed assistant curator.

During Franklin D. Roosevelt's administration, by Congressional action, the island became the Canal Zone Biological Area, an official government agency. On July 16, 1947, it was finally transferred to the Smithsonian.

What has a decade of Smithsonian administration brought? First of all, greatly improved quarters and facilities for the resident staff and visiting scientists. While the lodgings may lack the luxuries of a resort, they are far from primitive. There are electric lights, refrigeration, running water and toilets. Miles of marked trails have been cut through the jungle in all directions from the hillside compound overlooking the lake. Concrete steps and a baggage funicular lead up from the boat landing, arrival place of visitors from the Panama Railroad whistle-stop of Frijoles.

Just beyond the narrow trails, however, and sometimes on them, the teeming life of the tropical jungle unfolds as it has for countless centuries. The novice who walks too fast or too noisily may not see much of it because, despite restrictions on hunting or harming any of the wild creatures on the island, most of them instinctively fear man. Rope-like vines, parasitic vegetation, long swaying ferns and soaring ceiba, balsa and maria trees form an interlocking and almost impenetrable mass of growth, concealing much of the continuous battle for existence that goes on everywhere on the island. There are plenty of sounds, day and night—from the chattering of Amazon parrots and the anguished cries of howling monkeys, to the cooing of short-billed pigeons and the incessant hum of bees and other insects. Hundreds of birds and clouds of butterflies flash their colors as they

dart in and out of the jungle's sunlight and shadow. Aviators say they can see the bright blue wings of the great Morphos butterfly as they pass over the island.

Now and then, along the trails, there is evidence of man's activity, as he attempts to part the jade-green curtain just enough to wrest from the jungle another of its age-old secrets. Short rows of wood samples, each soaked in a different solution, invite termites to the attack, so that science may learn more of the habits and

life-cycle of this scourge of the tropics. Here is an anthill, surrounded by a fence, and there a screened bottle, an insect trap, hanging from a tree. At night, cameras are rigged with flash bulbs, which automatically snap candid portraits of animals or reptiles that nibble at bait, or stumble over trip wires. It is thus that the island's shy big cats—ocelots, pumas and jaguars—are observed. The jaguar does not live on Barro Colorado, but swims over to hunt.

While the island is not open to the general public, there has always been a rather lenient policy about one-day visitors who can think up any legitimate reason for making a call, and *who write in advance for permission*. Last year 636 persons spent at least a day on the island, and some stayed several days. Quite a few of them were science writers and teachers, who took pictures in color to supplement papers and lectures. In recent years about forty accredited scientists annually have resided at the compound from a week to several months while engaged in research projects.

The beneficial results of these and many other studies have appeared in more than 600 books and articles on various phases of tropical biology, physiology, medicine, forestry, zoology, ornithology, botany, and in more definitely utilitarian papers, such

as the effects of the tropics on photographic materials and processes, and the wear and tear of sun, heat and humidity on textiles, plywood and various kinds of packaging containers. One of the most difficult projects, still being conducted, seeks a repellent for a tiny fungus that etches the lenses of cameras in tropical climates.

During World War II, the station did its bit by devoting all efforts and facilities to solutions of scientific problems related to jungle warfare, including investiga-

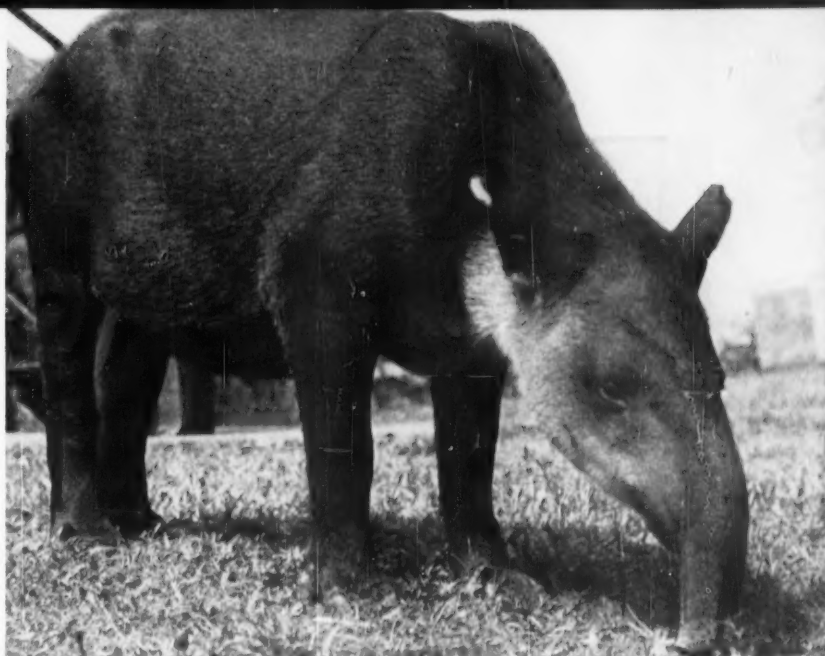


A visitor to the Barro Colorado Island station holds a baby sloth picked up on an island trail.

tion of corrosion and deterioration of various military equipment under tropical conditions.

In addition to an herbarium and a library, the station also maintains a complete index of every form of plant and animal life that has been observed on the island. More than 7500 species now are included, and hardly a week passes that a new entry is not made. Incredible as it may seem in so limited an area, Barro Colorado has some 1200 kinds of spiders, a thousand varieties of ferns, seventy-five different mammals, more than 500 species of fungi, algae and mosses, and about three thousand different kinds of plants, vines and trees.

Dr. Zetek's annual reports to the Smithsonian disclose the scope and variety of



One of the seventy-five different mammal species found on the island is the tapir. At the left is a baby tapir with stripes, quite different in appearance from the adult.

some of the projects undertaken by visiting scientists, who now come to Barro Colorado from many parts of the world. A Harvard professor, for instance, spent several months studying blood parasites and ticks. A scientist from the American Museum of Natural History has confined himself for several years to an investigation of army ants. Plants of pharmaceutical value interest a Department of Agriculture specialist.

In addition, there have been such highly technical researches as "mechanism of coagulation of insect haemolymph" by a scientist from the University of Liege, Belgium, and "collection of pentatomids, scutigerids and related forms of spermatogenesis studies" undertaken by a medical student from Johns Hopkins University. Scientific papers based on studies made at the station have averaged about twenty-five a year since 1923.

Barro Colorado has its share of poisonous snakes, including the deadly coral and fer-de-lance, as well as the

bushmaster. But they hide in the depths of the rain forests, seldom showing themselves. There is no record of anyone dying of snakebite on the island. White-lipped peccaries or wild pigs, however, menace anyone who comes near their young. Army ants bite viciously if you cross their paths, and there are the usual annoyances of the tropical wilds—gnats, ticks, chiggers and mosquitoes. Malaria, however, is virtually unknown.

Even the casual visitor is fascinated by some of the strange forms of life that occasionally show themselves, even at the edge of the compound. Fat tapirs, anteaters,

armadillos, spotted deer, and a funny little fellow, coatimundi, which looks like a raccoon, all lend a zoo-like air to the place, except that the creatures wander at will while mere man must stick to the clearings and paths!

Back in the forest depths there is a weird "time bird." This is the rufous motmot, whose two central tail feathers are elongated and broadened at the tips. Perched on a twig in the jungle, the bird swings this tail regularly from side to side, with an almost precise interval, per swing, of a little more than a second. One might keep roughly accurate time by watching it.

Another strange fellow is the grotesque "witch bird," the Ibycter or fruit-eating hawk. The size of a raven, it has black feathers with a white vest. But its feet are scarlet and its long bill is green-yellow tipped with blue. Naked skin around eyes and throat accentuate its witch-like appearance. Despite the creature's perpetual scolding, when anyone nears its perch, (continued on page 52)



A group of high school girls wait their turns for visits from chickadees, nuthatches and titmice.

*Investment in patience
pays dividends in*

Friendship with Wild Birds



Jean Young is fascinated by a sprightly visitor, and (below) Emily Alvord, a polio victim, gets a real thrill.



HAVE you ever enjoyed the thrill of having a wild bird come to your hand for food? It is an experience of which you will never tire. Although all wild birds are naturally shy of human beings, many may learn to trust you so completely they will light on your hand, shoulder, or head as readily as they would on a tree branch. It is only a matter of a liberal investment of patience to be able to earn such dividends.

For many years my hobby has been taking color motion pictures of wild birds and mammals. Then, one day, I watched chickadees taking sunflower seeds from the hand of a friend, Lawrence Howe, who had a small bird sanctuary near Belmont, New York. I decided to go and do likewise. So, in 1940, I purchased fifty acres of land along the Genesee River near Wellsville, New York, and gave the name of Wild Acres to this tract.

This sanctuary is partly hilly and partially wooded, and boasts several springs, brooks and small ponds. It had many species of trees and shrubs, which provided berries for birds, already growing on it, and other fruit-bearing shrubs have been planted to give it added attraction. Supplementing the natural hospitality of the sanctuary, various types of feeders provide food in winter, and a lean-to covered with evergreen boughs is stocked with stale bread and scratch feed. It is a popular avian spot. Since the sanctuary is not accessible by car in winter, a log cabin was built in which to store a winter supply of grain.

With all these assets and its unusually large concentration of birds, Wild Acres soon became a favorite spot of young peoples' organizations and Audubon groups. Trails through the woods attract old and young, and in winter skating and tobogganing are popular. But the biggest surprise for visitors, particularly those who have not been there before, is to be greeted by a bird lighting on them, seeking food.

This extra-added attraction is the dividend of patience. It is not easy to get the first bird to light on one's hand for a sunflower seed, or a raw, unsalted peanut. But once the confidence of one bird has been gained, others follow suit with comparative ease. Before making friends with the birds I remove food from nearby feeding stations and pick a cold winter morning. Standing or sitting near the lower branches of a tree, so a bird will have to drop only a short dis-

By PAUL M. DAVIE

Photographs by the Author

tance to my hand, I let patience take over. Sometimes ten minutes are required; sometimes half an hour. It is necessary to remain perfectly motionless. A jerk of the hand or the head, or other quick movement must be avoided. I have found, too, that keeping my eyes closed, or nearly so, assures better success. Birds seem to have less fear if they feel they are not being watched. Once they are confident the eyes seem to make no difference, however.

I have found that chickadees are the birds easiest to tame. Also, one tamed chickadee will quickly inspire its fellows to follow example. After I had won the friendship of most of these little birds, a nuthatch got the idea. This was hastened by holding my hand next to a rough-barked tree, such as the huthatches like to climb around. Soon the bird would fly long distances to my hand, often deliberately picking over my offerings to select the choicest morsels. Titmice followed the example of these two species, although they do not linger long on the hand. During some winters downy woodpeckers have become so tame that they will remain for as long as three or four minutes on my hand, feeding from a piece of suet, even turning their backs on me with a complete lack of fear.

Varying the feeding practice, I will close my hand and put a sunflower seed between my teeth. The chickadees soon learn that this is no problem, and light on my lips, brace themselves and pulling until I release the seed. This method of feeding is always the most popular with my younger visitors.

Since I have combined a reforestation project with my sanctuary I always find work to do on my twice-a-week visits to Wild Acres. The birds always find me in whatever corner of the fifty acres I happen to be working. I keep a good supply of food in my pockets so they will not be disappointed when they come. Usually I let them beg a while before pulling out food. One winter day I decided to feed all comers as fast as they came. In a thirty-minute period a total of two hundred and twenty-five chickadees came to my hand for peanuts or sunflower seeds. I think there were about twenty birds in this flock that kept coming for repeated handouts.

When the spring nesting season arrives I see very little of my tame bird friends until the following fall. They are usually off some distance from our cabin raising their families. The only food I supply during the summer is suet. The various woodpeckers are constant patrons of the large wire suet basket hung on a tree near our cabin throughout the year. In the fall, as soon as the mornings begin to be frosty, I start renewing my acquaintance with my bird friends. They are shy, at first, but soon regain confidence, slowly at first, but more readily as cold weather comes on. By early winter the old friends are all back. With them come flocks of their young, who quickly acquire the confidence and lack of fear shown by their parents.

Taming wild birds has been one of the most thrilling and rewarding experiences I have had during the sixteen years since I began my sanctuary project. Any one with patience who really desires to tame the birds can have the same worth-while experience. 🐦🐦

for January, 1957



The author's granddaughter, Barbara Smith, never tires of visits to Wild Acres. Here she is host to a nuthatch.



Janie Colburn watches the friendly chickadee with a rapt expression, and (below) Shirley Horn watches with delight as another chickadee comes to hand for food.



Some Bird Vignettes

By W. L. McATEE

IN THE memorably cold winter of 1917, Upper Currituck Sound, North Carolina, seldom closed by cold, was almost entirely frozen over. While I was there in December, came an eight-inch fall of snow, which about completed the sealing up of food supplies for birds. On Swan Island, the roof of a porch had kept its floor free from snow, and there I saw a woodcock, whose flexible bill is suited for probing only mud, or other soft or loose soils. He was trying it on the unyielding concrete.

Concerning two other vignettes of bird life, I do not say that the subjects felt frustrated for that would be a venture into bird psychology, but they were obviously, and, from my point of view, comically thwarted. One was a mockingbird that had successfully guarded through the winter the crop of crimson berries of some large Tatarian honeysuckles in Potomac Park, District of Columbia. I happened to be there at the right moment in spring to see a flock of grackles arrive and settle in these high shrubs for breakfast. The mocker tried to repel the invaders, darting at one and another of them, but he was only one and they were legion, and he had to yield.

The other instance of frustration also involved blackbirds, a mixed flock, seen at Travilah, Maryland. In their progress across some grassland, they came near several guineas. One of the latter began to charge the blackbirds, but in the rolling movement, characteristic of such flocks, the threatened individuals rose lightly and went to a forward rank. The guinea tried here and there and never came near pecking a blackbird, but was over-ridden and overwhelmed.

Point Pelee, Ontario, is a small but significant peninsula extending southward toward a chain of islands in Lake Erie, stepping-stones, as it were, for a famed bird-migration route. The novelty and scale of migrational events there, at least before the Point was covered with cabins, almost spoiled a bird watcher for less rewarding observations elsewhere. On October 23, 1931, I saw Point Pelee migration in full swing and I prize the memory. It was a "meadowlark day" and the birds worked down to the tip of the point, where they took off in flocks of varying size. There was a strong wind from the northwest and the birds battled their way upward and into it. Thus they headed about 135° away from their true course, evidently knowing that the wind would bring them to their destination. But

how did they know that? Ask the meadowlarks.

The association of birds with other animals is of varied interest. Two of my observations point to mutual advantage for birds and cattle. At the Santee Club, South Carolina, on a misty December morning, I noticed a phoebe keeping company with a cow. From a close perch it flew to the cow and snapped an insect, or the movement might be reversed. The bird showed no hesitancy in alighting on the dew-studded back of the cow and the latter seemed in no way disturbed. Later in the same winter at Gum Cove, southwestern Louisiana, I saw jackdaws clambering over cattle, apparently in search of ticks. These daws (boat-tailed grackles of the books), from thirteen to sixteen inches long, might seem a burden to an animal, especially when two or three of them were climbing up or down its tail, but the cattle showed no sign but that they approved. Stolidity may be the proper term for this bearing, but I am tempted to regard patience as the right word, for that is a quality eminently shown by the tribe when employed as draft animals by man.

SHORE WALK

*Oh, you who walk a city's street
And never know the sea's brown sand,
Come barefoot now to Folly Beach
Where wheeling sea gulls boldly screech
And sanderlings bow each to each
And herons calmly stand.*

*The lapping waves caress our feet
And star-fish float in on the foam.
A startled crab with eyes agog,
Darts to a sea-bleached driftwood log,
And prowling shrimp boats chide the fog —
As we go slowly home.*

Virginia C. Holmgren

The most colorful bird picture seen by me had a winter setting. At the Arnold Arboretum, near Boston, Massachusetts, where I was working in February, 1914, the ground was covered with snow—a fine background for color. Near my window was a flowering apple tree, its tall spire well laden with small, red fruits. Throughout the tree fed a flock of pine grosbeaks, crimson males and yellow females, both with black-and-white picked wings; while on the ground, gleaning fallen apples, were several ring-necked pheasants, gorgeous in bronze, green, and scarlet. One could not wish a greater visual treat, and without foreknowl-

edge could not have hoped to find it there, but there it was in lovely color.

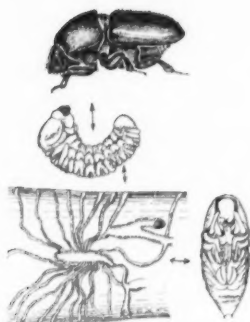
At a woodland pond in northwestern Florida, where herons and other water birds were nesting, Herbert L. Stoddard and I saw a little blue heron flying awkwardly across the central open space. Its movements were uncoordinated as if it were "scared to death." And why? A duck hawk was "riding" it, apparently just for sport, "tickling" the heron's back with its talons but making no effort to strike it. Still the heron had every right to be frightened for something much more unpleasant could have happened.



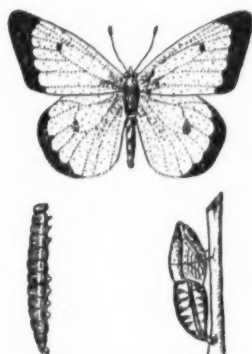
Insect Life in Winter

By E. LAURENCE PALMER

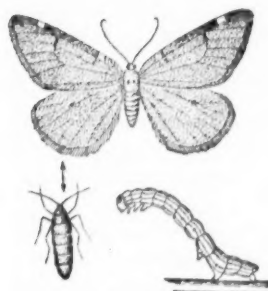
This is the eighty-ninth in NATURE MAGAZINE's series of educational inserts.



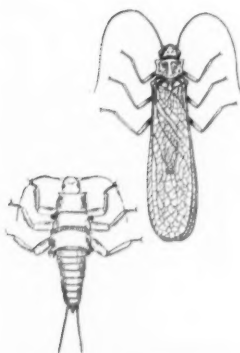
ENGRAVER BEETLE



CABBAGE BUTTERFLY



CANKERWORM



WINTER STONEFLY

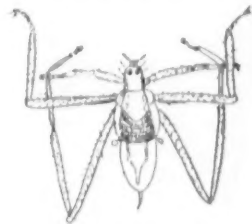
IT MAY sound strange, but the inspiration for this article came almost exactly one year before it was ready to appear in print. Stranger yet, it came not from experiences while hiking in the snow. Instead, it came as I lay in a hospital bed after a serious operation, and while I was listening to my first radio broadcast after that event.

The broadcast dealt with some Nature correspondence the broadcaster had been receiving, and revealed a rather serious hiatus in the experience of that naturalist of the air. As I lay there I began thinking about how an interesting story might be written about insects and the snow. Naturalists are often considered a bit queer, but when one goes into the field in the dead of winter specially to study insects it would seem that an eyebrow or two might properly be raised.

More than forty years ago I found myself charged with teaching natural history, under the guise of elementary agriculture, to a group of rural Iowa teachers. The school outline suggested that, in January, we have a lesson on cabbage butterflies and on insects in general. I could not find many cabbage butterflies, but I did dig out a mass of leaves from under some stones in a creek a short distance from my office. I took the mass into the laboratory, thawed out the ice, and used the insects, which were also thawed out, to show those teachers that insects could be found outdoors in Iowa during a January blizzard. I will never forget that day. I now find myself compelled to decide between studying the host of insects that may be found, any winter day, in almost any stream, or sticking to the original idea of studying insects that can be found elsewhere in such weather. Since the relatively recent 70th insert, and the first insert of this series, dealt primarily with insects in the water I decided to keep my feet and hands dry and warm this time, even though this requires that I give a new slant to consideration of some of the species that have been covered in other inserts. When we are through I am sure that you will feel that the expression the "dead of winter" may need to be qualified at times.



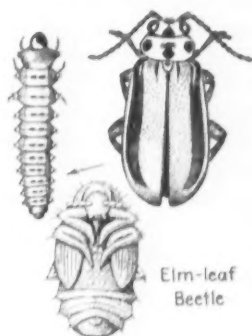
PINE-CONE WILLOW GALL



SNOWFLY



WOOLLY BEAR



Elm-leaf Beetle



Cotton Leaf-worm



Partial Moth



For once we are at a loss to find helpful references to the subject of our insert in *The Bible*, in poetry, or in masterpieces of literary prose. Neither do we know of any great artist who has pictured effectively snow and its associated insects. When I was in the Navy I remember meeting a child in a Chicago museum who was entranced by an exhibit case of white butterflies, and who commented to me that they should be the kind that fly over snowdrifts. So I elect to consider insects seen flying in the air over snow-covered ground; insects to be found on and in plants in the dead of winter; insects seen in dwellings trying to escape to snow-covered outdoors; insects to be found crawling over bare ground while snow is still abundant, and insects to be found on and in the snow itself.

The late Edith M. Patch wrote interestingly in her *A Little Gateway to Science* about mourning cloak butterflies that are likely to be seen in snow-covered woodlands almost any mild winter's day. I am sure that I could go almost to the exact spot where, as a youngster in a Cortland, New York, woodland I first saw a mourning cloak butterfly in the winter. What disturbed me most was the fact that when I first saw the butterfly I saw it distinctly, but by the time I reached the spot where it had been it had vanished completely. While I was looking about in confusion, and with some disgust, the insect suddenly reappeared close at hand. It had come to rest on the dark trunk of a tree, and in that setting it was practically invisible. I know now that I was rather lucky to get a second glimpse; frequently, this butterfly can hide itself rather completely under a piece of loose bark. Apparently sub-zero temperatures do not cramp the behavior of this butterfly, which is almost black if seen with its wings folded, but it has been my experience that bright sunlight does seem to have a stimulating effect, and I have seen them more frequently in late winter than earlier in the season. To me the most remarkable thing about a mourning cloak is not the beauty of the creature, with its wings spread, but the almost perfect camouflage effected by folding those same wings. Even the outline of the folded wings and the light outer border is more effective than would have been the case were the wings solid black and the outline evenly cut.

The same woodland that may show you a winter mourning cloak may also provide you one or more little moths flying about. The chances are rather good that these may be



CLUSTER FLY



OYSTER-SHELL SCALE



EARLY SPRING STONEFLY



BLACK BOREUS

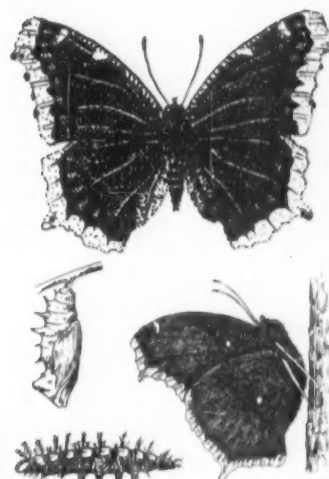
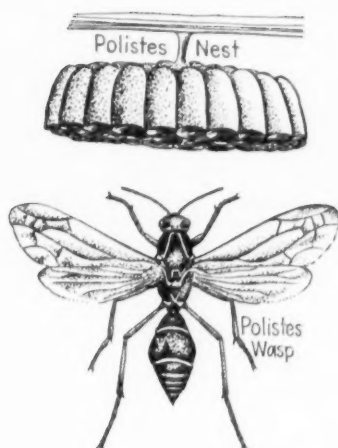


CONVERGENT LADY BEETLE

adult moths whose eggs develop into the "measuring worms" that may annoy you by dropping on you in early summer. The chart section will show you the interesting life history of these little, winter-flying moths, and should induce you to watch a flying moth to see if you cannot find the wingless female, which the male is in all probability seeking when you see it. These females hide in the crevices in the bark of trees, unless they get entangled in a sticky band put on the tree. One of the best means of controlling these insects is to prevent the wingless female from getting to a tree top to lay her eggs. You may find evidence, however, that a female cankerworm made the trip successfully if you find one of its egg masses, usually encircling some twig. These cankerworm egg masses do not resemble the varnished masses made by the tent caterpillars. Usually, however, the cankerworm egg masses do not have long to survive the weather. Usually, too, you feel as though the cankerworm moth left her job incompleting because it looks as though the egg-laying was just casually discontinued.

In country where sugar maples grow, almost any mild winter's day will afford quite a number of honeybees that have come out to feed on the sugary sap that has oozed from some broken twig. A bee's life is a busy one and, in part because of the drain on the stored honey by the wintering colony, it becomes necessary to restore the supply whenever this is possible. How far bees travel from their home colony to get food in winter I do not know, but I have seen bees that must have been caught by a quick change in temperature, or the weather, and who obviously did not make it home again. Sometimes these are even to be found on the snow.

We have already mentioned the possibility that white cabbage butterflies, so abundant later in the season, may sometimes be seen in the dead of winter. This is due to the fact that adults commonly winter successfully and respond rather readily to any suggestion that if winter comes spring cannot be far away. When it comes, they want to be the first to be on the job when any mustards show themselves. The chart sections suggest some interesting variations that take place, both in males and females, as the season advances, and suggest how you may learn to recognize, in a museum collection, the cabbage butterflies that were in an early season generation and those of the come-later crop. It may be nice to think that a white butterfly could easily use white snow as a camouflaging background, but it is difficult to imagine



MOURNING CLOAK BUTTERFLY →

where such a butterfly, or its young, could get a meal at such a time.

There are too many insects to be found hiding on and in plants in winter for us to more than mention a few, and these should be so conspicuous that almost anyone can find them on a winter field trip. We suggest investigating some of the scale insects to be found on the twigs of woody plants, these being representative of insects that live on bark in winter. Seek out a borer like an engraver beetle, which lives under the bark in winter, but whose presence can be detected. Find some insect that creates a change that may be recognized at a considerable distance in herbaceous plants, as is the case with the work of cattail moths. Or look for some insect-produced gall, such as the pine-cone willow gall found at the tip of willow twigs in winter. Once you seek these insects you should find others living similar lives.

Almost any woody plant is likely to have some scale insects on it, but ash, apple and dogwood are often spectacularly infected, so your chances of having good luck may be increased if you examine these plants first. Usually, too, you will be more likely to find your critters if you examine finer twigs rather than the coarser parts of the trees. I admit that, superficially, there is no glamor in a scale insect on a twig comparable with that of a mourning cloak butterfly fluttering through the woodland, but the scale insect does more damage to our apples and other fruit trees, our ashes and other timber trees, and our dogwoods and other ornamental shrubs. Whether we like it or not, we should know more about the scale insects than about a winter butterfly or moth.

The chart section should

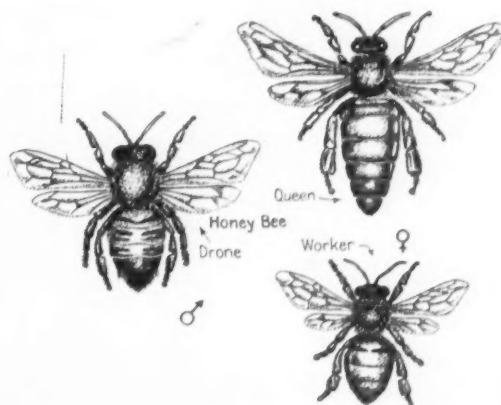
supply sufficient details of the life history of our scale insects, so no further elaboration is necessary. Do you have any idea what you may find under those scales? Have you any hunch as to any sex difference suggested by any of these scales? How do you account for the fact that scales are crowded on single twigs rather than widely distributed over a tree, or over a group of trees? These are some of the questions the charts should help you answer.

I doubt if there are many readers of these pages who have built fires in the woods from fallen wood and who, in so doing, have not at some time discovered the work of engraver beetles of one sort or another. When the bark is peeled from such wood there is usually left exposed the gouged-out trails left by the larvae that ate their way between the bark and wood as they grew in size. If you have a burrow of a true engraver beetle it may have the common brood chamber where a space was enlarged and in the walls of which the eggs were laid. From this central chamber the grubs worked their way outward. Can you find the trails of any of these that cross each other? Do you know the romance of that initial chamber? Can you find the "shot holes" made by the adults that emerged from the end of the tunnels? Notice how these differ from true shot injury in that

none of the holes shows splinters such as are caused by real gunshot. Our engraver beetles provide a story the plot of which should intrigue a writer for the movies. Surely it would be much better than some of the plots presented to us in the theatre and over television.

If we were Nature fakers we could write a good story about what lies behind the production of those pine-

(continued on page 32)



COMMON NAME SCIENTIFIC NAME	SNOWFLEA <i>Achorutes nivicola</i>	EARLY SPRING STONEFLY <i>Allocapnia</i> (<i>Capnia</i>) <i>vernalis</i>	WINTER STONEFLY <i>Taeniopteryx nivalis</i>	OYSTER SHELL SCALE <i>Lapidosphes ulmi</i>
DESCRIPTION	Members of group rarely to 1/5-inch long. Some may spring into air by suddenly releasing bent-in "tail." Wingless, with 6 short legs and rather short, stout antennae. Eyes degenerate. Mouth parts suited for chewing and sunk into head with only tips at surface. Some species can leap while others cannot do so. Six or less abdominal segments.	Adults appear from early January to late April. Adults are less than 1/4-inch long, with gales smaller and more slender than females. Dark brown to blackish, with hind wings folded to lie under the forewings when at rest. Terminal appendages of abdomen extend beyond wing tips. Antennae held to point forward.	Adults may appear from January 1 to May 1, emerging from aquatic nymphs and crawling about on snow. Adult is 1/4-inch long, slender, blackish-brown with smoky transparent wings, which equal length of body from snout to abdomen tip. Antennae held forward, about body length. Squarish head narrower than thorax. Wings overlap flat at rest.	General appearance like that of crowded oyster shells on bark of woody plant twigs. The related San Jose scale is more circular than is this species. Females are found under scales about 1/4-inch long, while males are found under the smaller scales. Males become winged, but females remain wingless.
RANGE AND RELATIONSHIP	Order Collembola. Family Poduridae. May appear in great swarms on snow in late winter making it black. Related <i>A. armatus</i> collects on fungi; <i>Podura aquatica</i> on standing fresh water; <i>Anurida maritima</i> along tide marks of shore of salt or fresh water. Some may swarm over clothing of human beings if they are present when abundant.	Order Plecoptera. Family Capniidae. Only one species east of the Rockies, but many related species found in northeastern North America. <i>A. mystica</i> appears late November to mid-February; <i>A. recta</i> from late November to late February; <i>A. granulata</i> from early January to late April or earliest May, all, of course, in genus <i>Allocapnia</i> .	Order Plecoptera. Family Perlidae. Ranges from eastern and central United States south to North Carolina. Found on snow near swift water of freshwater streams. Adults seem less alert than do the nymphs. Often may be abundant in great numbers, blackening the snow and crowding the tops of fenceposts and other exposed perches.	Order Homoptera. Family Coccidae. Worldwide distribution. This species is found on dogwood, maple and apple, with closely related species found crowded on twigs of ash and willow. Under some circumstances scales may completely cover the bark of twigs, with such infestations usually causing death of that part of tree.
REPRODUCTION	Obviously seasonal, but little known of life history except that young are much like the adults, there being incomplete metamorphosis, or at least no conspicuous age differences accompanied by conspicuous changes in the general appearance. Some authors claim there is no metamorphosis. They are primitively and entirely wingless.	Adults emerge from nymphs at water's edge and fly or crawl awkwardly upward, find mates, breed and, after this, females turn back to water to lay eggs and die. Eggs hatch into nymphs that spend nearly a year under water, developing to a size where they can emerge from water and from nymphal case to the ultimate in their life experience.	Where adults emerge in large numbers, shed skins of nymphs may appear in layers at water's edge. Adults may mate, then lay eggs in stream and die, with mating taking place away from water in which eggs are laid. Adults are short-lived but complete life cycle requires at least one year, although the adult stage may be most conspicuous.	Winter is spent in egg, although, of course, the scale is conspicuous throughout year. There may be 25-100 eggs under a scale. In late May nymphs emerge from under scale, crawl around for 3-4 hours then form their own scale, pierce stem to reach food and settle down for life, which may end in August. May be 2 generations a year.
ECOLOGY	Some species may swarm around vegetables; some on sap of trees, particularly from sap buckets; some feed on molds; some on algae; some on decaying vegetable material. Some are carnivorous, feeding on smaller snowfleas. Some, like <i>Isoloma palustris</i> , do not feed in winter, but in spring feed ravenously on diatoms and similar plants.	Adults probably eat nothing although they seem to have functional jaws. Nymphs feed on aquatic plants and animals and require water with high oxygen content, so are usually limited to swift streams with good volume through the year and with abundant shade, such as may be found in gorges. Normally cannot live long in aquaria.	Adults do not eat, fly little and are probably more active at night than by day. May crawl, not leap, over snow, making way usually to some elevated perch. Emergence is commonly from exposed stones in swift water. Related <i>Strophopteryx fasciata</i> is more local, but both species may be found emerging simultaneously from same stream.	Female lays eggs under scale that has protected her through her life, and food is sucked from plant host under that protection. In the year the first eggs on an apple tree, for example, may hatch about 2 weeks after apple-blossom time. The adults are active only during the summer months.
ECONOMY	Economic importance, if any, is usually negligible. Theoretically may pollute sap collected in sap buckets, but this is hardly significant. Some may be pests of succulent garden plants, and some surely assist the fungi in reduction of dead plant material to original state of "nothingness," although technically, of course, this is not a true statement.	Of no direct economic importance, but both adults and nymphs undoubtedly serve important role in supplying food to the usual fishes of their habitat. They may, incidentally, serve as destroyers and consumers of other insects. In addition to the stoneflies here considered there are other species appearing in warm times.	Since adults do not eat they are of little economic importance, except that apparently they are fed on by some birds. Nymphs feed on both plants and animals under water and form an early link in the food chain of aquatic plants to swift water species of fishes. While these are too small for bait, they are excellent food for game fish species.	Control is largely through destruction of infected material and through use of lime-sulfur spray applied regularly in 10% kerosene emulsion when plants are dormant, and a soap spray applied in late May when adults may be free and moving about, seeking to start a new infection and a new generation, of course.

LADY BEETLE <i>Hippodamia convergens</i>	ELM-LEAF BEETLE <i>Galerucella luteola</i>	ENGRAVER BEETLE <i>Scolytus rugulosus</i>	BLACK BOREUS <i>Boreus brumalis</i>	CATTAIL MOTH <i>Lymantria phragmatella</i>
Length about 1/4-inch. Appear like a small split pea. Shows two white converging dashes on back, in front of wings, 13 black dots on orange wing-covers and a white border on thorax. The legs are relatively short and slender. There are lady beetles, or ladybird beetles, that are red, black or yellow-spotted, or some entirely black.	About 1/4-inch long. Dull yellow with black spots on head and a black band near the outer edge of wing covers. Sometimes the whole aspect of the beetles is grayish. During hibernation as adults color may change from yellowish to dark green.	Length about 1/10-inch. Width about 1/30-inch. Uniform black except wing cover tips and parts of legs, which are red. Wing covers about 1/2 total length. Evidence of presence in winter indicated by burrows in wood under bark, or "bullet holes" in bark, even though these are records of earlier activity, except if new in late spring.	Length to about 1/4-inch. Front of head forms a trunklike prolongation. Abdomen much wider than thorax or head and female with long ovipositor. Legs slender, long and rather clumsy when in action. From above head looks like that of some dragonfly nymphs with prominent eyes. Wings of males poorly developed; of females vestigial or wanting.	Adult moth with wing-spread of about 1 1/2-inch, with wings at rest held like sides of a roof, straw-colored, slender, pale and silky. Has 2 conspicuous dots surrounded with white on the forewings. Hindwings are pale gray and hidden by forewings when at rest. Female is stouter in abdomen than is the male.
Order Coleoptera. Family Coccinellidae. There are about 100 species of lady beetles to be found in North America. Most of them are useful, but some like the Mexican bean beetle may become serious pests in some areas. This pest has spread from the Southwest to New England, and probably will continue to spread in the future.	Order Coleoptera. Family Chrysomelidae. Introduced into America from Europe near Baltimore about 1834 and now widely distributed over the country wherever elms, and particularly the English elm, are grown as shade trees. They are now firmly established in the fauna of our country, unfortunately.	Order Coleoptera. Family Scolytidae. This species ranges from Alabama north into Canada and west to Michigan, with closely related forms on west to coast. This species burrows in trunks and branches of apple, cherry, peach, pear and related species. Burrows under bark look like long-legged spiders with "legs" slenderest at base.	Order Mecoptera. Family Panorpidae. Not uncommon in eastern United States, but usually not noticed by casual observer. The related brown boreus, <i>B. novoriundus</i> , and the English, <i>B. hyemalis</i> , are more easily observed in winter than in warmer weather because of the white snow background over which they move rather awkwardly. Western species, 2.	Order Lepidoptera. Family Cosmopterygidae. Common wherever there are cattails, and cattails are worldwide in distribution, being found in both Americas, Africa, Europe, Asia and Australia where climatic conditions, particularly as to water, are at all suitable. Has a limited food range and so is restricted in range as above hinted.
Eggs are laid in spring after adults have hibernated, usually in great numbers crowded into a small area. Larvae, when first hatched, begin eating other small insects, insect eggs and even spiders. They grow rapidly and finally, when mature, pupate. Pupae hang by tails for few days before transforming into adults, completing cycle.	Yellow-orange eggs, laid on end in clusters of 5-30 on elm leaves, hatch in about 1 week into larvae, which are yellow and black and mature in 2-3 weeks, spending most of the time on elm leaves eating out all soft parts and leaving little besides the tougher skeleton. Pupate in ground for about 10 days. May be 2 generations a year.	In some species males, in others females, enter old burrow, enlarge it into chamber in which females are mated and in walls of which new eggs are laid. Eggs hatch into larvae that burrow just under bark, making increasingly larger tunnels until mature. After pupation adults make way through bark, causing characteristic "bullet hole" effect.	Eggs of European boreus are laid in early winter, deep in masses of moss, and, at temperature of 47°F., may hatch into larvae within 10 days. Larvae of <i>Boreus</i> lack abdominal prolegs. Pupal stage in most members of genus <i>Boreus</i> may be spent in earthen cell underground, but near the surface. Some larvae and pupae in moss and bark.	In winter, as larvae in stems or heads of cattails, presence often indicated by fluffing out of head. Pupates about 30 days in 2 1/2-inch, tough, white cocoon in stem or head of cattail in early spring. Adults emerge in May and lay flattened eggs on cattail spikes. Develop into 1/2-inch yellow-white larvae with red-brown markings.
Food of this species includes eggs and larvae of such pests as potato beetles, grape rootworm, asparagus beetles, chinch bugs, alfalfa weevils and bean thrips. There are few insects that help farm and orchard crops more than do the lady beetles. In West the fall hibernation is usually at higher elevations than where most of life is spent.	Adults, hibernating in houses, may crowd on windows in spring, seeking way to trees. Some may come out on warmer spring days when snow is still on ground. Earliest destruction of buds may be reflected in leaves with a series of holes caused by injury in young stages. Both adults and larvae are destructive of elms.	Larval stages may last 30-36 days, egg stage 3-4 days, pupal stage 7-10 days. Larvae of this species look like yellow-headed white grubs. In slash pine beetle an unusual thing takes place when males provide the burrows not only for one but for many mates. In that species there may be 2 generations with one wintering as larvae.	These "snowborn" insects seem something like injured crane flies. They may appear on the snow in early winter, but their abundance may increase as the winter advances. Sometimes newly fallen snow may be sprinkled abundantly with them over areas of a number of square feet. They may appear in abundance on the snow as late as March and April.	There is but one generation a year. Adults eat nothing. Larvae feed freely on tissue of stems, leaves and heads of cattails, the retreat to head and fluffing of head providing a superior insulation against the severities of winter and making larvae generally inaccessible to animal enemies. Has few natural parasites.
Convergent lady beetles are collected in hibernating area by the ton. Some 30,000 are considered adequate for protecting 10 acres of cantaloupes from destructive scale insects. They are a recognized commercial product. Related destructive Mexican bean beetle is controlled by spray of magnesium arsenate.	Cause great damage to valuable shade trees, and much money is spent in their control by use of sprays. Usual practice is to apply lead arsenate just after buds open to kill wintering adults, with a second spray 2 weeks later to kill larvae that survived first control measure. Possibly adults could be trapped in winter.	Highly destructive group of beetles, not only because of direct injury but because of introduction of fungi as of Dutch elm disease. Some trees down larvae with sap. Infected slash should be burned to destroy insects; white-washing fruit trees in March, July and October may help. Demonstrated that resins offend and sap attracts adults.	There is little likelihood that these insects are of any economic importance whatever. Their consideration is made here solely because of the fact that their presence on snow frequently arouses interest. The illustrations show how conspicuously they differ from most other "snow insects."	Little, if any, economic importance because of small economic importance of cattails and because of minor injury caused to the host plants anyway. Moths might serve as a minor source of food for some marsh birds since they are abroad while some marsh birds seek food for their young.

COMMON NAME SCIENTIFIC NAME	CANKERWORM <i>Alophila pometaria</i>	WOOLLY BEAR <i>Ixia isabella</i>	CABBAGE BUTTERFLY <i>Pieris rapae</i>	MOURNING CLOAK BUTTERFLY <i>Aglaia antiopa</i>
DESCRIPTION	Wingspan of male 1-1 $\frac{1}{5}$ inches. Female practically wingless. Male of fall cankerworm, <i>A. pometaria</i> , darker smoky or brown-gray than that of spring cankerworm, <i>Palaeocrita vernata</i> , and with a distinct whitish spot on front edge of the forewing. Females are, in general coloration, like the males but are wingless as suggested.	Wingspread of moth to 2 inches. Forewings of male buff brown with small black spots. Hindwings straw-colored. Body dirty orange with black spots. Female similarly colored or may have flesh-colored hindwings. Body rather stout but narrower than thorax. Antennae slender and about 1/3 length of forewing.	Wingspan to 2 inches. Male with forewings white, black-tipped above and with 1 black spot, which may sometimes be absent in spring individuals. Hindwings white above and yellowish beneath. Female much like male, but forewings have 2 black spots instead of 1, and these may be smaller in spring individuals. Wings folded at rest.	Wingspan to 3 $\frac{1}{2}$ inches. Male with maroon forewings, with broad straw-yellow borders, with blue spots on upper surface, almost black beneath, as shown with wings folded. Hindwings much like forewings but with suggestion of "tails." Female generally similar to male in pattern and coloration. Rare variety has wide, straw-colored border.
RANGE AND RELATIONSHIP	Order Lepidoptera. Family Geometridae. Fall cankerworms are found in injurious numbers through northeastern United States and, in some numbers, west to California. Spring cankerworms are more eastern. The related cankerworm of Europe was mentioned in a 1611 edition of <i>The Bible</i> .	Order Lepidoptera. Family Arctiidae. Common in northern United States from the Atlantic to the Pacific, where it is best known in the caterpillar stage as woolly bears that are seen crossing highways in the fall or spring in varying degrees of haste and effectiveness. Related smaller yellow-bear caterpillar moth is <i>Spilosoma virginica</i> .	Order Lepidoptera. Family Pieridae. Common over wide areas but limited to Temperate Zone. Three groups of the family, the whites, the yellows and the orange tips are recognized in eastern United States. There are at least a dozen species of whites to be found in North America, and many of the other groups. Introduced into America about 1866.	Order Lepidoptera. Family Nymphalidae. Found throughout all temperate regions. In America gets south to Guatemala. Known in England as Camberwell Beauty although it is rare in that country. May come into houses. Most common near woodlands, June-August. May be found flying through snow-covered woodlands in dead of winter.
REPRODUCTION	Female lays several hundred gray eggs in rows on the bark or twigs of deciduous trees, usually in fall or even in spring. These hatch into measuring worms when the leaves appear and feed about 1 month, when they drop to ground at end of long thread. There they pupate 1-4 inches underground. Males fly to mate with crawling females.	Females lay nearly 1000 eggs, yellow, spherical, slightly spaced in patches. Caterpillars furry, red-brown, with black ends, when young are social, and when grown may lose much of black ends. Winter as caterpillars under trash, feed in spring, then pupate under cover in cocoons made of silk and caterpillar hairs. Pupate about 2 weeks.	Winters as pupae or as adults. In North there are three generations a year; in South, to 6. Eggs are yellow, flask-shaped, with 12 vertical ribs, usually laid singly on under side of leaves of food plants. Hatch in about 1 week. Larvae are green, slightly hairy, with yellowish back band, to 1 inch long, maturing in 2-3 weeks before pupating.	Dark brown to black, barrel-shaped eggs laid in rings around twigs; hatch in 6-16 days depending in part on temperature. Mature larvae to 2 inches long, with angled head, black body and head. Body spined and white-spotted with red on middle of back. Prolegs reddish. Group stays together. Pupate on twigs, 8-16 days, dark brown with red points.
ECOLOGY	Food of caterpillars largely leaves of deciduous woody plants. When leaves are destroyed new forage may be reached by being blown by wind at end of silk. Control may be effected by spraying and by preventing crawling females from reaching treetops, where eggs will be laid. This is done by sticky areas around the trunks.	Food of caterpillars a variety of plants, with only slight preference being shown. Cocoons are commonly found under stones and boards, or sometimes on fences, and are well known by any amateur naturalist. No relationship whatever between length of winter and percentage of black and brown on caterpillars. Young more black than old.	Pupae green, slender, angular, to 5/8-inch long on some support, lasting 10 days to over winter. Food of larvae is primarily cabbage and the closely related mustards. Caterpillars may eat way into heads of cabbage ruining their commercial value. Chickens that may eat the larvae or pupae may be adversely affected by them.	Caterpillars feed on leaves of willow, poplar, elm, hackberry and other trees. Working as a group they may clean a branch completely of its leaves. Adults feed on nectar collected through long curled proboscis. This is one of the largest of the butterflies in its range to winter in the adult form.
ECONOMY	In years favorable for cankerworms whole trees may be denuded and weakened. They may be among the worst enemies of shade trees. Both males and wingless females may be found on or near trees, even when snow covers the ground, even though escape from underground pupae must be made through snow-covered ground at times.	Of little or no economic importance because they do not specialize on plants of economic importance. Rarely sufficiently abundant to be considered as pests. Skunks and some other animals roll caterpillars to remove hairs before eating them. Make interesting animals for home or school terrarium.	Obviously of negative economic importance. Control is by spraying and by hand picking. Not infrequently in early spring, before the snow has left the ground, adults may be seen flying over fields. They may have wintered in the shelter of some building and come out when atmospheric conditions at least indicated nearness of spring.	Sometimes this species is considered as a pest because of its destruction of portions of useful shade trees. However it never reaches the population numbers of many of its relatives and can hardly be considered as a pest when compared with them. Some degree of control may be effected by the collection of egg masses found on twigs.

SNOWFLY <i>Chionea valga</i>	CLUSTER FLY <i>Pollenia rudis</i>	PINE-CONE WILLOW-GALL GNAT & GUEST GNAT <i>Rhabdophaga strobiloides</i> and <i>Cecidomyia alborivittata</i>	POLISTES WASP <i>Polistes sp.</i>	HONEY BEE <i>Apis mellifica</i>
These look like 6-legged spiders since superficially they show no wings. Wings are reduced to the merest knobs and are in no sense functional. Of course, 6-legged character separates them from 8-legged spiders. The average crane fly looks superficially somewhat like a large mosquito. Legs are hairy, body $\frac{1}{4}$ -inch.	Length to about 1/3-inch, slightly larger than housefly, sluggish in behavior, with wings not so widely spread as those of housefly. Thorax dark, woolly with hairs. Abdomen brown with pale spots. Space between eyes white. When smashed, leaves a greasy spot and gives off disagreeable odor at times.	Since the presence of these insects is more easily recognized by their habitat than by the insects themselves we consider the pine-cone willow gall. It appears at the tip of pussy-willow twigs and looks coarsely like a pine cone. In its heart in winter is the larva of the gnat, and, between the "scales," the guest.	Length of adult 1 inch or more. Long slender, dark brown to black with red spots on the abdomen and with one or more yellow rings. First abdominal segment is narrowed in front, unlike the broad and blunt counterpart in the yellowjackets. Male has a pale face and shorter antennae than the brown-faced female.	Worker or sterile female about $\frac{1}{2}$ -inch long may be seen in winter on warmer days feeding on sap from broken twigs of maples and similar trees. Drones and queens to $\frac{3}{4}$ -1 inch long not likely to be seen in open in winter. Swarms of 60,000 bees probably all of one colony. Workers live 1-2 months; drones, 1-2 months; queens years.
Order Diptera. Family Tipulidae. The generic name <i>Chionea</i> refers to snow. The related <i>C. araneoides</i> found in New York State has had most of its immature stages and its general biology described in some detail. Members of the genus are to be found throughout the North Temperate Zone, including some 8 species.	Order Diptera. Family Calliphoridae. Introduced from Europe at an early, unknown date. May be found on snow acting as though partly frozen, but commonest on windows exposed to the sun. With falling temperature seeks darkness when thermometer reaches 60°F., but with rising temperature seeks light at same temperature.	Order Diptera. Family Cecidomyiidae. Host plant, <i>Salix cordata</i> , is widely distributed. Location on the plant is relatively limited to an end bud in whose developing leaves, at an early stage, an egg <i>Rhabdophaga</i> was laid. The range of <i>Cecidomyia alborivittata</i> is restricted by presence of gall caused by <i>Rhabdophaga</i> .	Order Hymenoptera. Family Vespidae. Closely related to the hornets. There are 4 variable species of <i>Polistes</i> in United States and about 50 in the world. <i>P. annularis</i> has showy yellow margins on last abdominal segment, <i>P. pallipes</i> a uniformly brown abdomen; <i>P. variatus</i> has many yellow spots and bands.	Order Hymenoptera. Family Apidae. Are domesticated world over and related wild species are used as a source of sweets. Must have suitable nectar-bearing plants for food source, but may be found in forests, fields, parks, or even in heart of cities in bee trees, or in artificial hives. Food of adults mostly pollen and nectar.
Adults may come out on snow in bright sunlight and mate even when temperature is down to zero. Females usually appear in early morning. After mating, female works way down into snow, or, if possible, down to earth and lays elongated eggs, which hatch into pale yellow larvae. These develop into pupae and then into adult stage.	Adults mate in February and first warmish day may lay eggs on garden soil or in lawns. Eggs laid about 1 month after mating, one laying to nearly 100 an evening. Eggs hatch in 4-6 days into white, legless maggots that parasitize living earthworms for about 3 weeks, then escape to soil. Pupate 2-6 weeks and then, as adults, repeat cycle.	<i>Rhabdophaga</i> lays an egg in willow bud. Egg hatches into larva and bud develops into a gall. Larva lives in heart of gall through summer and winter, pupating in early spring. Adult emerges and lays eggs. <i>Cecidomyia alborivittata</i> lays egg between "leaves" of gall. Egg hatches and larva develops as guest in gall caused by <i>Rhabdophaga</i> .	Female lives through winter after having mated with male, who dies. She may appear in warm spells on windows. In spring she builds a paper nest in sheltered spot with downward-pointing cells but no cover beneath. In these the eggs are laid and the young reared. Grubs hang downward and are fed nectar and insects.	Queens and drones mate in flight in summer. One fertilization effective for 8 years. Fertile queen usually starts new colony. Wax comb built by bees or man. Eggs laid in comb develop into larvae; pupae and adults cared for by workers. Egg to adult queen $15\frac{1}{4}$ days; to worker 21 days; to drones 24 days. Drones from unfertilized eggs.
Obviously these insects are affected by light and temperature, judging by their behavior, since they emerge on snow most commonly on mild, sunny days. Apparently move upward with rising temperature, but after mating the females, at least, tend to work their way downward, probably to a place where eggs may be laid effectively.	Food of larvae is earthworms. Of 107 earthworms examined 74 supported 87 cluster fly maggots. In addition to reacting to light at 50°F., the flies push against contact below that figure and avoid it above that figure. Flies may be trapped by light, using data given above, or may be killed by DDT sprays around windows or on flies directly.	Illustration shows larva of gall gnat and of gall guest gnat. Apparently guest is wholly dependent on gall gnat to make gall which it needs. The gnats are smaller than mosquitoes and look superficially like them. The whole gall, gall-gnat, gall-guest-gnat, willow arrangement is much like a boarding house, with the gall gnat the responsible host.	Pupae are in silken cocoons in nest and adults emerge to mate and build another nest and complete the cycle. Nest is supported by a single stem, is waterproofed by new material licked on by female. Food not ordinarily stored, since young are fed as needed and female hibernates. Nests may be built in colonies.	In queenless colony new queen may develop from queen cell, or from egg or worker larva not over three days old by enlarging cell, changing food from beebread to royal jelly. Would take one bee working alone 64 years to produce 1 pound of honey, or 50,000 bees working one hour to do the same. Useless drones are killed when appropriate.
It is doubtful if there is any economic importance to these insects, but there is no doubt but that they intrigue the imagination of those who may see them at least for the first time. Some of their relatives, like the Hessian flies, may do great damage to crops, but no such relationship is recognized with the snowflies.	Common strength of suitable spray is 1 pound of 50% wettable powder, or one quart of 25% emulsible concentrate in 6 gallons of water. This may be applied to screens, walls, ceilings, floors, or wherever flies may be found. Greatest concentrations in fall or spring as outside temperature hovers around 50°F. Natural enemies of useful earthworms.	There is little possible economic importance in this whole arrangement but it is intriguing to the naturalist and since it is conspicuous in winter when snow is on the ground and involves insects it seemed appropriate to give it this rather unusual recognition in this part of the chart section.	Possibly of some economic importance as destroyers of other insects. Common about houses and school rooms in fall and spring. Are feared more than justified since they may be handled gently with almost perfect safety, although they are perfectly capable of doing serious stinging if forced to do so.	One pound of honey represents 20,000 bee trips averaging 1 mile a trip. Possibly most valuable of all insects because of production of honey and wax and also because of service in pollinating plants, particularly the flowers of important fruit trees. United States produces about 500 million pounds of honey a year, 10 million of wax.

(Continued from page 27)

cone like structures you see so frequently at the tips of willow branches on a winter's walk. Again our chart section provides you with most of the details. Some of the insects involved in this story are so small that you in all probability will never see them. But you can see easily the work they have done and may understand the variety of interests involved. In this story we are challenged by the fact that an insect can lay an egg in an opening willow bud, and that the resultant larva may so affect the bud that, instead of forming a normal twig, it develops into a waterproof house in the center of which is an ever-ready supply of food. And, apparently, the more this food is consumed the greater is the production of that food. And yet man prides himself on his superior mastery of the world in which he lives. Of course, our story is not complete unless we recognize that in the rooms between the leaves of this gall house live the larvae of other insects that probably never see the creature that caused the house to form, never pay rent for use of these rooms and probably never even visit with their landlords. When we understand this story we sometimes wonder at man's conceit.

Cattails are worth study at any time of the year, but in winter they may be especially interesting. Many a time, when my hands were cold, I have stopped and filled my mittens with the fluff of a cattail top, thus finding that my hands became warm quickly. Many times, too, when I did this I found a little caterpillar hidden in the fluff. Some of these larvae are yellow and about one-half-inch long, and they develop into the cattail moth considered in the chart section. Farther down in the stem may be a larger larva that reaches a length of two inches and is sought by fishermen as bait for fishing through the ice. This may be the larva of the cattail miner, *Argema obliqua*, which is not ordinarily found in the cattail head. We show the picture of the moth but not a picture of the larva.

We must confine our consideration of most of the insects found in the house, and apparently trying to get out into the snowy landscape, to what appears in the chart section. Almost any winter window, late in the season, should provide good collecting if you seek ladybird beetles, polistes wasps, cluster flies, or elm-leaf beetles, with the last mentioned being the least likely to be found. Attic windows often provide better collecting than other windows in a house when you seek these insects. The school page that supplements this insert gives emphasis to the study of these insects.

And now we get down to consideration of insects on the ground, or on the snow, in winter. One of the commonest of these is also one of the most misunderstood. By some it is sought because it is rumored that the length of the winter can be predicted by the percentage of black to be found on a woolly bear caterpillar. It might be equally effective to predict the length of a season by examining the percentage of white hairs on a man's head. Young men and young woolly bear caterpillars are likely to have a larger percentage of their hairs black, and that

is about all there is to this superstition. Old men who still have their hair may have it turn white, and mature woolly bear caterpillars have the black areas at each end taken over by an increasing area of brown. These caterpillars, young and old, may live through the winter. On some mild winter day they frequently may be seen moving across some bare, earthen space.

I have seen approximately half of the kinds of insects mentioned in the chart section on snow itself. In late winter cluster flies that have escaped from a house or barn frequently may be seen. They walk clumsily over the snow, or may make their way to some bare earth. Early in the spring they lay their eggs on this earth and from the eggs develop larvae that live in the bodies of earthworms. It is a case of the early fly that gets her worm as a home for her youngsters.

Near rapidly flowing streams in early spring the snow may be almost covered with adult stoneflies of one sort or another. We present two, and you may become sufficiently interested to try to see adults emerging from their nymphal cases on stones that rise, temporarily at least, above the dashing icy water of the stream in which, until now, the insects have lived their whole life. While these adult stoneflies can fly, they do not leap as do some other snow insects. They mate and make their way to some elevation, such as a fence post, from which they again take flight and return to the stream to lay their now fertilized eggs.

The common name black boreus should suggest a black critter that is conspicuous in winter, if ever. This is true of a little black scorpion fly that is only about one-quarter-inch long, has six long spiderlike legs and a proportionately large head. The female has a long egg-laying structure to the rear. The wings of the males are poorly developed, and those of the females either wanting or vestigial. These little insects may come out on the snow, find mates and return to some exposed moss or other vegetation, where they lay their eggs, which, in about ten days, will hatch into larvae. Their abundance seems to increase as the winter advances. Were it not for six instead of eight legs one might guess that a boreus was a spider.

Another spiderlike creature to be found crawling on the bare snow is the true snowfly, which is a crane fly. Their wings are the smallest of knobs and of no value whatever in flying. The legs are hairy, like those of some spiders, but, of course, there are only six legs. These flies will make their way to the surface of the snow when the temperature is down to zero but when the sun is shining brightly. The females appear early in the morning, and, after having mated, make their way again down through the snow, or along plants near the snow, until they reach a place where they may lay their eggs.

On sunny days in February or March the snow around the base of some trees may be pocked with little black specks less than one-fifth-inch long. These may suddenly be hurled into the air, for they are springtails, or snowfleas, among the most primitive of the insects. Their life history is not too well understood. ❧ ❧

What Is the Whooper's Future?

An Editorial

SOME fifty people recently filled the conference room of the Secretary of the Interior and devoted an entire day to the fate and future of a bird—the whooping crane. Called by the Director of the U.S. Fish and Wildlife Service, the meeting was attended by officials of the Canadian Wildlife Service, representatives of State conservation agencies, and individuals in one way or another concerned with, or about, the whoopers. Such considerable expenditure of time, money and thought was in itself a refreshing example of democracy at work, and reassuring in a world of tensions and materialism. We doubt that it could have taken place elsewhere.

Canada and the United States share custodianship of the remaining whooping cranes. They nest in Canada's far North, near Great Slave Lake, and winter on the Aransas National Wildlife Refuge in Texas. Twenty-eight whoopers were resident on the Refuge last winter, twenty-five going north in the spring. One bird disappeared during the past winter; one was injured and captured, and went to the San Antonio, Texas, zoo; a third elected not to go north. Two birds—a pair—are in the New Orleans zoo, where they hatched chicks last spring, but these did not survive.

With these numbers, and with two perilous flights to make each year, it is obvious that the whooping crane is on the ragged edge as a species. This situation has developed two schools of thought with respect to the management of the birds. One holds that the future of the species depends upon management under conditions of captivity, or semi-captivity; the other contends that the whoopers cease to be a wild species unless they are managed and protected as such under natural conditions.

In the discussion at the whooping crane meeting it was brought out that the birds once nested in Saskatchewan, but that man's impact has sent them farther north, where their breeding season is shorter and therefore more uncertain. The last nest recorded in Saskatchewan was in 1922. Also human development makes the migratory flights more dangerous, and some of the conditions on the Aransas Refuge are less than ideal. The Intra-Coastal Waterway, for example, passes through the sanctuary and occasionally a member of a boat crew, with nothing else to do, will take potshots at cranes. A hurricane, it was pointed out, might wipe out the flock in a matter of hours, and an epizootic could be equally devastating.

In view of such threats to the future of the whooper, proponents of captive breeding asserted that it was a

question of ecology, not biology. The remaining birds are a sturdy lot with no signs of senility or the deteriorating effects of inbreeding. In the wild their lives have about a seven-year span, they are not productive every year and have a short productive life at best, with the contribution of a pair adding up to about half a youngster a year. In captivity, it was said, the life-span could probably be trebled, at least.

Opponents of a zoo-like management of the whooping cranes asserted that little is known about raising young whoopers under captive conditions. There has been no success of this sort of record. It was pointed out that the campaign of education in Canada and the United States has created an international solicitude for the birds. Their goings and comings are watched with interest and concern. Given the maximum protection along their migratory route, Nature can take care of matters. A refuge on the Platte River in Nebraska, where the whoopers traditionally stop en route, was urged as important. Capturing young for breeding in captivity would be difficult and possibly fatal.

It was urged, therefore, that every possible additional protection be given the birds. Conditions in the wintering area should be improved. Public education should be continued, even to the extent of prohibiting the shooting of any large white bird. At the most only injured birds, or whoopers that might otherwise become captive, should be used for captive breeding. More care should be used and more study devoted to rearing successfully the young of the birds now in captivity.

Certainly this interesting meeting resulted in the thorough airing of all views with respect to the present and the future of the whooping cranes. All present were concerned with only one thing—the perpetuation of the species and the increase of its numbers.

With all the information available from experts such as Winston Mair, D.A. Munro and Fred Bard of Canada and Robert P. Allen, J. Clark Salyer, John J. Lynch, Dillon Ripley, Julian Howard and others in the United States, the meeting became well and broadly informed. Upon this basis it was agreed that an international committee of wildlife officials of the United States and Canada should be appointed fully to explore the whole problem. It was plain that even more than has been done must be done if the whooping crane is not to become one with other vanished species—stuffed creatures standing amid a habitat group background in museum's of natural history.





Bound by the common bond of winter hunger,
coyotes, magpies and ravens feed in amity
on remains of a buffalo.

VIEWING a typical mid-winter landscape in the higher and wilder parts of Montana or Wyoming, is to know a deep sense of its Arctic-like austerity, and to wonder how, in that universe of deep snow, any wild creature can escape hunger. A lone rough-legged hawk, or a golden eagle stands sentinel on a half-buried fencepost, bird and post stark and black against the snow. One seems as inanimate as the other. A magpie flies from one bleak, skeleton tree to another, seeking some morsel of food. A coyote howls, a call of hunger from the barren wastes of sagebrush. You wonder—how do they all find enough to eat? The answer is simple—often they do not.

Some years ago rangers in Yellowstone National Park waged systematic war on coyotes throughout the long winter. It became so that it was difficult for a man to get within rifle-range of these wary animals. Yet a ranger, after a night in a snowshoe cabin, would waken to find fresh coyote tracks up to the very door of the cabin, and the thongs of snowshoes that stood within arm's reach of the threshold would be gnawed to shreds. Hungry coyotes gave the headquarters community at Mammoth Hot Springs a wide berth during daylight hours, but at night hunger drove the animals to raid the back-door garbage cans.

In one particularly wild and desolate region I had an experience that disclosed that hunger may be combined with bad temper. It was in the dead of winter. Approaching a small log-cabin, I saw that the strongly-built door stood unaccountably open, hanging from one hinge. The scene was one of general havoc. Bed clothes were scattered over the deep snow. The heavy wood-burning stove, together with its sand-box, had been pushed awry. Every cooking implement had been knocked from the walls. A tin, black-pepper can had been chewed into a shapeless wad. Finally, a sack of oats that had hung from a nail near the ceiling had been torn down and its entire contents devoured. Tracks of a large grizzly bear, all over the premises, left no possible doubt of the marauder's identity. I followed back for a considerable distance on the trail that led to the cabin, as well as for some distance on the trail that led away. It was a good stride from one deep track into the next, and the tracks were a loose fit to my heavy hunting shoes. I never got within sight of bruin, who must have been routed out of his den by a snow-slide, but he surely had been hungry-mad.

Another scene of hunger was witnessed close to Yellowstone Park headquarters. Following the close of the tourist season, one obstreperous old buffalo bull of the small "exhibition" herd refused to return to the range. So the old bull had to be killed, and was left where it fell. Then resident Park Naturalist, I visited

the spot later just as the first pale, colorless, streaks of a cold dawn appeared. I saw a memorable spectacle, fully typical of the place and season, with its zero temperature and the frozen patches of sagebrush jutting through the deep snow. Dominating the scene were five coyotes, while two ravens and a small flock of magpies completed the gathering. Famine makes strange

companions. Three of the coyotes were for the moment fairly content, having somewhat eased the pangs of hunger. The other two were busy burying for future use small shreds of the frozen buffalo meat. This kept them trotting to and from a nearby thicket of small willows. They made each round trip in one to two minutes, cautiously and in complete silence.

One would have expected the coyotes to attempt to catch the birds, now so close and supposedly

such desirable prey. However, there was never any such marked attempt. In fact, not one of the entire company seemed to pay any particular attention to any of the others. The scene was eloquent of peace, or at least of momentary amity. It is well known that a forest fire will unite deer and cougar, lynx and bear, and wood folks in general into a single desperate company, each member concerned only with escape from the common danger. Apparently there is a similar effect when famine drives beasts and birds together around the only available source of deliverance from starvation.

As the belt of pale sky broadened over the eastern horizon the coyotes showed some uneasiness. Soon, one by one, each on a route of his own, they slipped away. The birds continued their meal. My hands, now numb, had been supple long enough for me to sketch a record of hunger in the wild.

Elusive and shy as is the marten, extreme hunger can even change the habits of this lovely creature. This was proved when a marten rather successfully contended with a park ranger for possession of a can of salmon, the contents of which meant more to the animal than any danger.

While, of course, it is possible, through patience and repeated effort, to induce many wild creatures, whether bird or mammal, to feed from one's hand, the pressures of weather and lean times can abet such experiment. One animal that finds it difficult to meet the challenge of intense cold and deep snow in the high Rockies is the delicate flying squirrel. One visited my cabin under such conditions and began at once to eat from my hand. The next night he returned and brought with him two of his fellows. All were equally hungry and equally unconcerned about any threat that might lurk in their newly discovered automat. I did not delude myself that the squirrels had gained any new confidence in man, but concluded that any fear was counteracted by a greater dread of the specter of starvation.



Hunger in the Wild

By EDMUND J. SAWYER

Illustration by the Author

The Marvelous Seeds of Trees

By HENRY CLEPPER

*Photographs from the U.S.
Forest Service*



Sugar maple

Large cones of the sugar
pine of California.



White oak



OF ALL living things none are more majestic and awe-inspiring than the sequoias of California. The coast redwood, the taller of the two species, attains a height of 360 feet, the most imposing wonder of Nature on earth.

The marvel is not that the redwood is so gigantic, for, huge as it is, two other species are nearly as tall—the blue gum of Australia and the big tree, also of California. No, the marvel is that it grows from a seed so small. In truth, the seed of the redwood is one of the smallest of the conifers, requiring no less than 122,000 to weigh a pound.

But light as it is, the redwood seed is a heavyweight compared to those of some other tree species. Consider the cottonwoods, which get their name from their minute "cotton" covered seed. A pound of these contains from three to seven million individual seeds.

At the other extreme is the coconut, the weight and tough shell of which could conceivably kill a man if the nut fell on his skull, from tree height. Water-tight and buoyant, the coconut depends for dispersal upon the sea, where it drifts on the waves until it is cast up on a hospitable beach to germinate.

Most seeds, however, especially the light ones, are scattered by the wind. Others, heavier, have developed special attachments to make them airborne. Thus, the flat seed of the elm is surrounded by a membranous

wing. The basswood has a plane-like wing, botanically known as a leafy bract.

The familiar seed of the maples is provided with a "key," known as a samara, two of which are joined together, diverging at an angle of about 45 degrees. Similar to the keys of the maple are the winged samaras of the ashes and the tulip tree. They twirl in the air while falling, and in a stiff breeze may be carried long distances.

A fascinating variation of the manner by which seeds are disseminated is demonstrated by the witch hazel. The seeds of this shrub-like tree do not just fall; their expulsion from the seed capsule is, to use a commonly understood expression, "jet assisted." Actually, the small brown seed is enclosed in a pod that splits open at maturity with an audible report, and shoots the seed for some distance. The propulsive force is brought about by the pressure on the seed of the hard lining of the seed cavity.

Any one with knowledge of botany understands the difference between fruit and seed. Usually, the difference is readily apparent, although occasionally it may be obscure. Often seeds are embedded in the flesh of edible fruit to attract animals that will eat them and thus aid in their dissemination. A well-known example is the cherry, the pit of which is hard enough to pass unharmed through the digestive tract of a bird.

Many tree species have fruits of which the chemical or physical composition is so designed as to discourage animals, including humans, from eating the seed before the proper time. An example is the black walnut, its thick pulpy husk containing tannin. Another is the persimmon, the immature flesh of which is astringent, but when ripened by frost it has a rare sweet flavor.

Still another example is the pawpaw. Its fruit, resembling a sausage-shaped balloon, is a creamy yellow pulp, sweet and edible when ripe, but quite unpalatable for human consumption when green.

Other trees have their seeds enclosed in fruits protected by sharp prickles and spines. Familiar examples are our native chestnut and the chinquapin, their spiny burs containing nuts unsurpassed by any others for delicious flavor, raw or roasted.

Some tree and shrub seeds are so minute that they require no wings for dispersal. The beautiful rhododendron, or great laurel, of the eastern United States produces seeds that are actually dust-like in their minuteness. Powdery in appearance, five million weigh only one pound.

The willows have seeds almost as small. Like the poplars, the seeds of willows have hairy attachments. Airborne, they may travel great distances.

Some of the birches have exceedingly light seeds, too. The paper birch, the attractive introduced European white birch, and the gray birch each produce an average of between one and two million clean seeds per pound.

Considerable variation exists in the weight of seed as produced by species of the same genus. Among the well-known genus of firs (*Abies*), the average number of cleaned seed may vary from a low of 6000 per pound, for

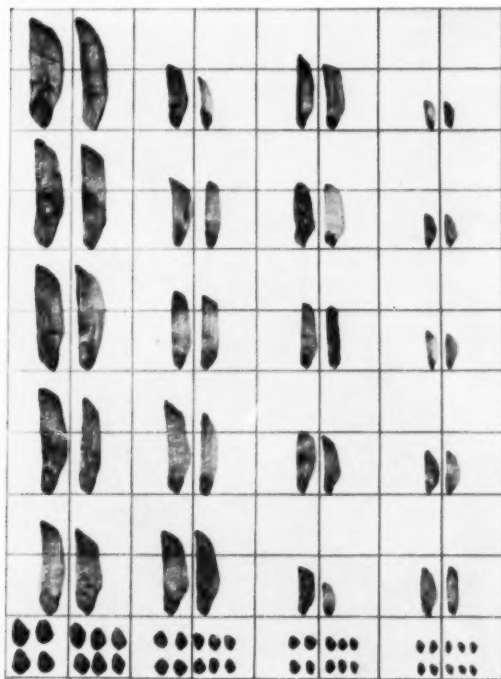


The prickly fruit of the chestnut protects the seeds that lie within the burr.

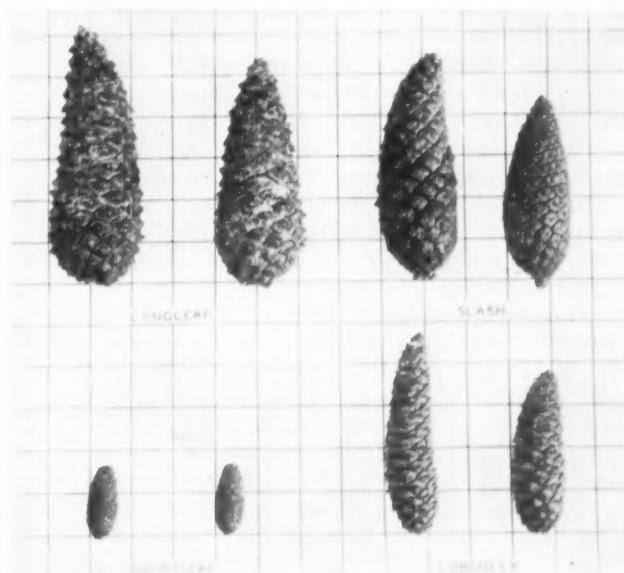
the California red fir, to a high of 60,000, for the balsam fir of the East.

Likewise the spruces (*Picea*) exhibit wide diversity in those species commonly planted in America. From a low of 47,000 seeds per pound, for the familiar Norway spruce, the highest number is 510,000, for the black spruce of the North, so valuable for pulpwood and Christmas trees.

Well known to botanists is the fact that the firs and



From left to right, at the left, are representative seeds of longleaf pine, slash pine, loblolly pine and shortleaf pine, shown both with and without wings and against a background ruled in inches but here reduced. Below, mature, unopened cones of the same trees.



spruces are members of the great family known as Pinaceae. But the pines themselves constitute one of the most numerous genera in this family, and, moreover, show the greatest variation in the size of their seeds. Those acquainted with this interesting genus know that the seeds of the pinyon pine of the Southwest are not only edible; they are among the most delicious nutty fruits produced by native trees. They average about 1200 cleaned nuts to the pound.

But the pinyon seeds are not the heaviest. The heavy-weights are those of the small Torrey pine of southern California, which yields a low of 400 cleaned seeds to the pound. Almost as large are the seeds of the digger pine, another small tree native to the dry foothills of southern California, which gives 700 seeds to the pound.

At the other extreme are some pine species the seeds of which, under certain conditions of soil and moisture, may be unusually small. For example, the commercially valuable jack pine of the Lake States may yield a quarter-million seeds per pound, although the average is nearer half that number. The lodgepole pine of the Rocky Mountains produces a small seed, too. It averages 100,-000 to the pound.

No pine, in truth no coniferous tree of America, has a more striking cone than the western white pine, approximately fifteen inches long, and three inches thick, it yields an average of 2100 seeds per pound.

The eastern white pine, one of the most graceful and handsome trees of the northeastern United States, has a much smaller cone and smaller seeds—27,000 to the pound, on the average. The red pine, also called Norway pine, the species most extensively used for reforestation in the northern United States, yields 52,000 seeds

to the pound, which makes it rather an average tree.

Gravity, unassisted by wind or water, is the principal method of dissemination used by those species that produce heavy fruits, such as the horsechestnuts or buckeyes, walnuts, oaks, and hickories. Of the three native species of buckeyes, the California buckeye, a low tree that often grows in dense shrubby thickets, has the heaviest seed, averaging ten to the pound.

The hickory species may range from a low of twenty-five nuts (with shell removed) to the pound, for shell-bark hickory, to a high of 225 per pound, for pignut hickory. Wide variation is found also in the weight of the several species of walnuts, ranging from a low of fifteen seeds (hull removed) for butternut to one hundred per pound for the black walnut. Actually, black walnuts average forty to the pound, and may be nearly as heavy as butternuts with twenty to the pound.

In all the American countryside, from coast to coast, perhaps no tree genus is more familiar than the oaks. People who know little or nothing about botany still recognize acorns. They, too, differ in size and weight. The heaviest acorns are produced by the bur oak, also called mossy cup oak and overcup oak, forty or more to the pound. The lightest are the acorns of the southern red oak, averaging 600 or more to the pound. The handsome white oak of the East, perhaps the best known of all, produces 150 seeds per pound.

Most forest trees, whether natural or planted, are propagated from seed. Consequently, the forester and nurseryman constantly seek new knowledge about the development and behavior of seed. In general, the larger the seed, the larger will be the seedling. That is why the size of seed is so important.

Tansy

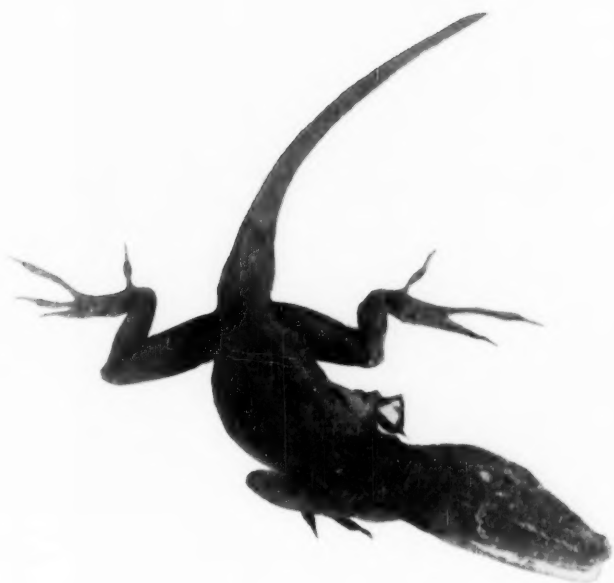
By MILDRED FIELDER

TANSY'S vivid yellow buttons, topping dark fern-like leaves, are seen along the highways from midsummer to fall. Grown in herb gardens since the days of Charlemagne, it has escaped to grow wild today across America. Tansy was used in tansy cakes, puddings, tea, and served in spring for health. An old recipe says "use tender young leaves sparingly with fish or meat." Tansy tea was once believed to have a nerve-calming effect.

Two varieties of tansy are common, the *Tanacetum vulgare*, or common tansy, sometimes called the fern-leaved tansy, and *T. crispum*. Both varieties have been used for their medicinal or industrial value, being used in cosmetics, toilet waters, ointments, and even as an ingredient in Chartreuse liqueur. Ordinary folks use them only for beauty.

One can dry tansy buttons for winter bouquets, and the golden yellow of the flower heads will stay bright all through the winter. Cut the tansy when it is freshly opened, tie in small bunches and hang with heads down in a cool shady place to dry. There you have it—beauty for the white winter months and a spot of color for a vase on the mantel piece.





PHOTOGRAPH BY TOD SWALM

Deiroptyx— Cuba's Reptilian Oddity

By WILFRED T. NEILL and

E. ROSS ALLEN

In general appearance, *Deiroptyx* is much like the familiar little anole or "chameleon" of the southeastern United States, but is much larger. Note the pineal eye on top of the head.

FOR SOME years our interest in herpetology has led us to many areas. The West Indian islands have lured us several times because of their variety of frogs, lizards and harmless snakes, as well as a few freshwater turtles. Unfortunately many island species have a tenuous hold on existence, and many West Indian reptiles have already vanished before the onslaught of civilized man. The unwarranted introduction of the mongoose, especially, has played havoc with various small and harmless reptiles of Jamaica, Hispaniola and Puerto Rico.

Fortunately, the predatory mongoose has made no great headway in Cuba, which harbors two distinct species of crocodiles, a big rock-iguana and forty-odd smaller lizards. Also, there are about sixteen kinds of snakes, including one large and several small boas, a single species of freshwater turtle in addition to the widespread sea turtles, and more than forty kinds of frogs. Of all these creatures, perhaps the most remarkable is the lizard called *Deiroptyx*.

It was in October that we made our first trip to Cuba. Our jeeps and equipment went by ferry from Key West, Florida, to Mariel, in Piñar del Rio Province about twenty miles west of Havana; we by "Q" Airlines plane. October had been chosen because it was near the end of the Cuban rainy season; ponds and streams would be full of water, the woods damp, the animal and plant life conspicuous.

Through good fortune we had received permission to camp and collect specimens at Rancho Mundito, the estate of Colonel Fulgencio Batista, in the mountains of Piñar del Rio Province. So we recovered our jeeps and headed westward through such towns and villages as Guanajay, Artemisa, Santa Cruz, Consolación del Sur.

From the last we left the highway to follow a steep, rutted wagon trail that wound ever upward into the mountains.

Eventually we arrived at Rancho Mundito. As the Spanish name indicates, it was truly a "little world" hemmed in by mountains. Looking across the tiled veranda and the gardens beyond, we caught glimpses of dense woods, bamboo thickets and a clear stream tumbling over a rocky bed. Even the grounds themselves appeared to hold promise for the naturalist, with old moss-grown stone walls, banks of shrubbery, and great India-rubber trees here and there. In Cuba, many harmless little reptiles and amphibians live about gardens, walls, shrubbery, and buildings.

The first night a hard rain fell, and hundreds of giant tree-frogs appeared from beneath the roofing tiles. Almost every tile seemed to have a tree-frog under it. As the rain poured, the amphibians continued to emerge

The scientific name, *Deiroptyx*, means a "humped-over fold," and refers to the fold of skin beneath the reptile's neck. The sticky tongue is useful in lapping up insect prey.

PHOTOGRAPH BY TOD SWALM





PHOTOGRAPH BY DOROTHY CLAUSSEN

A clear stream in Pinar del Rio Province, Cuba. The branch overhanging the water was the resting place of a *Deiroptyx*.

from their hiding places, crawling down the walls, hopping into the palm trees and on the shrubbery. These frogs, known scientifically as *Hyla septentrionalis*, somewhat resemble the common tree-toad of the eastern United States, but are much larger and much noisier. Their calls unite in a deafening chorus. The next morning we found that the frogs had been depositing their eggs in rainwater held by great ornamental jars in the garden.

As the days went by, we found many other species of frogs, as well as various lizards and snakes. About the stream were bullfrogs, introduced into Cuba from the United States, and a harmless aquatic snake known locally as the *catibo*. A real prize was a seven-foot specimen of the Cuban boa, known as *maja de Santa Maria*. Like all Cuban snakes, it is non-venomous. Then, one morning, we had our first encounter with that remarkable reptile, *Deiroptyx*.

We had been pushing through the brush at the edge of the stream, and paused a moment to scan an area where thick vines and fallen branches dipped into the water. Suddenly, a scrap of bark seemed to detach itself from a rotting limb and dive into the water with a little splash. It did not reappear. As we took a closer look, there were other splashes. We had happened on a colony of arboreal and aquatic lizards, each about fifteen inches in total length, mottled greenish-brown, and almost indistinguishable from the bark and rocks on which they dwelt.

When approached to within six or seven feet, the reptiles would dash or dive into the water and hide beneath stones on the bottom. Lifting stones and grabbing, we caught several specimens, which proved to be the species

Deiroptyx vermiculatus, Cuba's most interesting reptile.

So far as is known, this lizard is confined to Pinar del Rio Province, which forms the western end of Cuba. It is related to the familiar little anole or "chameleon" of our own Southeast, and can change color similarly. However, it lacks the characteristic "dew-lap" or throat fan of the anole lizards, having in its place a transverse fold of skin. And, unlike its United States relative, the Cuban lizard is large enough to inflict a painful pinch, and can even break the skin with its sharp teeth. But the bite is not venomous, and is no more dangerous than a briar scratch. Under each of the lizard's toes is a swollen, pad-like structure that affords the reptile traction when crawling over slippery surfaces.

Deiroptyx can dash about on vines and twigs, run along the under side of a log, squeak like a mouse, mew like a kitten, dive like an Olympic star, and remained submerged for ten or fifteen minutes. Like an alligator, when submerged it can draw a transparent membrane across each eye, permitting underwater vision. More amazing, it can run for short distances on its hindlegs alone. Finally, if surprised on land, the lizard will dash for the nearby water and then "skitter" fifteen or twenty feet across the surface before it dives. For this reason some Cubans, intending no irreverence, call it *lagartija de Jesu Cristo*. Sometimes they call it *caiman*, also, in allusion to its aquatic propensities and its long, crocodile-like snout. Since the true caiman is not a lizard but a relative of the alligator, we prefer *Deiroptyx*, which means a "humped-over fold," and refers to the transverse fold of skin to be found across the lizard's throat.

We are tempted to call the creature "Three-eyes," because of an eye-like organ on the top of the head. Scientists call this the pineal eye, and it is one of Nature's mysteries. A pineal apparatus of some kind is present in all the backboneed creatures. In certain species it is a small, glandular body seated upon the brain; in others the gland is accompanied by an externally visible organ on the midline of the head. The lampreys, common in northern lakes and streams, have a fairly well developed pineal eye. In some of our abundant catfishes the organ is visible as a tiny, bubble-like structure on the back of the head. In the familiar bullfrog and leopard-frog there is a vestige of the pineal eye in the form of a little whitish spot between and slightly in advance of the eyes. Directly beneath the "brow spot" is a comparatively large pineal body, attached to the brain. In the fence lizards, which are common throughout most of the United States, the pineal eye is plainly seen as an enlarged, flattened and somewhat translucent scale. A similar structure is exhibited by many other lizards, and there is evidence that the little green anole, or "chameleon," of the Southeast can actually detect light by means of its pineal apparatus. Baby snakes of many kinds display two small, black, crescent-shaped marks on the back of the head, enclosing the area of the pineal vestige. In the tuatara, the most primitive of living reptiles, the "third eye" is not externally conspicuous but includes a retina, a lens, and a nerve stalk leading to the brain.

Among warm-blooded creatures—the birds and mammals—there is only a pineal gland. In man this body is a cone-shaped structure about the size of a pea, arising from the upper surface of the midbrain but completely lapped over by and buried beneath the cerebrum. Early anatomists were puzzled by the function of man's pineal body, and finally suggested that it was the seat of the soul! Today it is thought to be glandular in function, pouring a secretion directly into the blood stream. Seemingly it governs the attainment of sexual maturity; for when young rats are injected with pineal extract, they develop precociously. One might say, however, that the pineal body is still the least known of all man's anatomical structures.

It is even more astonishing to learn that, in the lower vertebrates, the pineal apparatus arises embryonically as an extra pair of eyes. In lampreys, the left-hand member of the pair never develops far, while the right-hand one goes on to become the pineal eye. By way of contrast, in the tuatara it is the left-hand member that persists.

Ages ago, even before the rise of the dinosaurs, certain primitive amphibians and reptiles had a sizable and

probably functional pineal eye. In the fossil remains of these creatures, the bony socket of this curious structure is large and elaborate. Among living organisms, the pineal eye seems to reach its maximum external development in the Cuban lizard, *Deiroptyx*.

The pineal organ of *Deiroptyx* is protected by a bony rim. The area of skull beneath the "third eye" is translucent, and the external surface of the "eye" is likewise translucent, with a silvery cast. The structure seemed too elaborate to be completely non-functional, and we considered the possibility that it might be sensitive to

light, as in some other creatures. Accordingly, the lizard's true eyes were covered to exclude all light rays. In this condition the reptile apparently did not distinguish a shadow thrown on its head, but in a darkened room it could detect a small beam of light cast directly on the pineal eye. When the beam was turned on, the lizard would raise its head, turning it about as though in an effort to locate the light. It would also breathe more rapidly when the "eye" was illuminated.

However, we have always been more interested in the habits of wild creatures than in their laboratory responses, and we turned our attention again to the *Deir-*

ptyx colony along the stream at Rancho Mundito. We discovered that the lizards had rather keen hearing, and could be startled into the water by a sound. At night they slept, always head down, on leaves, vines or logs; at the cracking of a twig many of them would drop head-first into the water. So aquatic were they, we suspected that they might eat minnows. Certainly their large, strong teeth seemed adequate for such a diet. The teeth in the forward portion of the mouth tapered to a sharp point, while those farther back had two such points and the rearmost ones three. Our supposition proved to be in error. Eventually we found that the lizards were insectivorous, catching their prey about the stream-side rocks and logs. Roaches, crane flies, lacewing flies, beetles and spiders were the main items of diet.

Some of the lizards had crescent-shaped scars on the body. These scars were the right size and shape to have been made by other lizards of the same kind. The scarred individuals were all males, and most of these had broken tails. (Like the majority of lizards, *Deiroptyx* is capable of regenerating a broken tail; but the new appendage is never as long or as brightly colored as the original one.) Evidently the males sometimes fight each other, as is true of our common "chameleon."

We never witnessed an actual combat, but some of the lizards, when cornered, seemed quite willing to fight with us. They would flatten the body in a vertical plane and turn sideways to us, thus (continued on page 52)

H-O-M-O-G-E-N-I-Z-A-T-I-O-N

(Earthworms homogenize the soil.)

*The earthworm who, described as lowly,
Grinds, like the gods, exceeding slowly,
Doth also grind exceeding small.
By diligent, continual
And thorough subterranean toil,
He doth homogenize the soil.*

*O worm, who stoppest not nor starvest,
Thou makest best our richest harvest!
And we, with art that represents
Superior intelligence,
Compose a word of Grecian balance
To match your length but not your talents.*

Burnham Eaton



Pretty flanked by her 1950 twins. They are looking at the kitchen door, from whence come the handouts.



A common sight at mealtime as seen from the author's dining table, which is close to the home window.

Pretty—The Story of A Deer

By JANE HUTCHINSON

Photographs by the Author

A FAMILIAR face was missing as the summer of 1953 came to the Archer and Anna Huntington Wildlife Forest in the Adirondack Mountains of New York. It was the face of "Pretty," a white-tailed doe deer of mature years who had been one of the forest's attractions to students, faculty, visitors, and particularly to the people for whom the Forest is a year-round home. Pretty, until her absence that summer, was a friendly but unrestrained member of the Forest community, free to come and go as she chose. At least as many as six—possibly as many as thirteen—years ago she decided that man was her friend.

Since the autumn of 1949 Pretty had been observed as closely as it was possible to observe an animal free to roam over thousands of acres. She was an almost daily visitor at the kitchen door or window of the residences, her hopeful, trusting eyes intent; sensitive, swiveling ears alert to catch the first sign of footsteps coming her way with a little snack. Almost anything was considered "good groceries" in Pretty's dietary, but sugar doughnuts and peanuts were her favorite foods. During winter months, when natural food was difficult to find, she expected (and got!) a daily ration of shelled corn, which, added to her natural browse, apparently kept her in tip-top condition.

For five years, to our definite knowledge, Pretty's offspring were twins, and what is more appealing than a pair of stilt-legged fawns, "heeling" in their mother's

tracks, as she slips through a sunlit clearing? The youngsters were born around Memorial Day, as near as it has been possible to determine without snooping. They were usually from two to four weeks old before they were allowed to come near the residences in daylight, and then only one at a time, at first.

Pretty nursed her babies on our lawns; taught them with nudges, with the stamping of a forefoot, with a noise made by blowing air through her nose, and occasionally with a blow from the dewclaws. Courtship has been conducted there, also. Pretty once led her amorous pursuer a merry chase around and around the buildings, stopping at the back porch for a refreshing snack and then dashing on her way with a cabbage leaf hanging from her mouth, as he came around the corner.

This friendly, trusting deer was the subject of many unforgettable pictures: Pretty, placidly chewing her cud on the snow-covered, sun-dappled hillside at the rear of our house—Pretty, resting in a fern-bed, undisturbed as a power lawn mower whirled its noisy way to within ten feet of her, with nothing but a quick swallowing of the cud to indicate concern—drinking from the bird bath—catching a nap on a bed of leaves that had blown into the open side of the woodshed—listening at the kitchen door, her breath clouding the glass—curiously watching the man of the house as he idly tossed stones from the driveway, her head bobbing up and down as her eyes followed the pick-up and the throw—proudly watching

her little buck as he bounded and raced with incredible speed back and forth, back and forth, over the rocks and stumps and fallen trees of the wooded hillside.

If anyone happened to go to the woodshed while Pretty was resting there, it was a question as to who was most startled—the doe, suddenly to see a person slip into view around the corner, or the person, to see a red-dish or grayish shape sail past him. The feet of this fleeting figure no doubt touched the ground at least once before it reached the shelter of the woods twenty odd feet away—only to wheel and come trotting back—but the impression was that the creature had no legs at all!

Pretty was matriarch of this particular area—a radial territory of approximately one-half mile, to the best of our knowledge—and successfully defended it from other deer, even from her offspring of preceding years, who attempted to chisel in. Pretenders to the throne would be tolerated for a time on the fringes, but should they venture too close, the proprietress, eyes ablaze and ears laid back, would send them high-tailing with a few clips with her powerful forefeet.

The statement that our deer was almost a daily visitor is true, with the exception of a period of a few weeks at the time of the heaviest snows, when she and her current twins, apparently obeying strong instinct, left the vicinity of her human friends and joined other deer in winter quarters. In her case this was an area of evergreens and old fields that provided both shelter and browse. It was about two miles from her summer habitat, and a State highway traversed it. There she went every winter, faithfully reporting back when spring was around the corner. But this past spring Pretty did not return and she has been seen no more. Many things could have happened—injuries caused by the jack-straw tangle of wind-thrown trees, with resultant inability to browse; attack by a dog against which a deer has no defense in deep, crusted snow; a hurrying automobile; a fall through the lake ice; or possibly a "jacker," although it hurts to think of man wantonly and illegally killing an animal in whose eyes he was "friend." It may have been just plain old age, or an accumulation of ills due to unnatural diet. What-

ever the cause, we only can hope that death was instantaneous.

With our contributions of civilized food to this deer we may have done her a great disservice, as she doubtless became lazier than a wild deer should be. We do feel, however, that the scale may be balanced in our favor

by the interest in, and respect for, all wildlife engendered in many people who have shared our acquaintance with her.

Pretty is missed by everyone who knows the Forest. However, only a few weeks ago—just before they departed for environment more suitable for winter living—a young doe, one of Pretty's 1951 twins, with her own first baby, and also a year-and-a-half-old self-assured little buck, one of Pretty's 1952 twins, stood on the lawn not twenty feet away. These three were staring at the window, radar ears cocked, in a very familiar manner. Who will win out as ruler of this territory is yet to be determined. It is quite likely that, should the buck succeed in permanently chasing the doe away, he, in turn, will be discouraged. Although it would be interesting to observe him closely from year to year, the reputation bucks have earned for erratic and unpredictable behavior makes it a little too risky. It is probable, however, that, of his own choosing, he will seek more distant pastures.

* * *

Two years have elapsed since Pretty's story was written. The

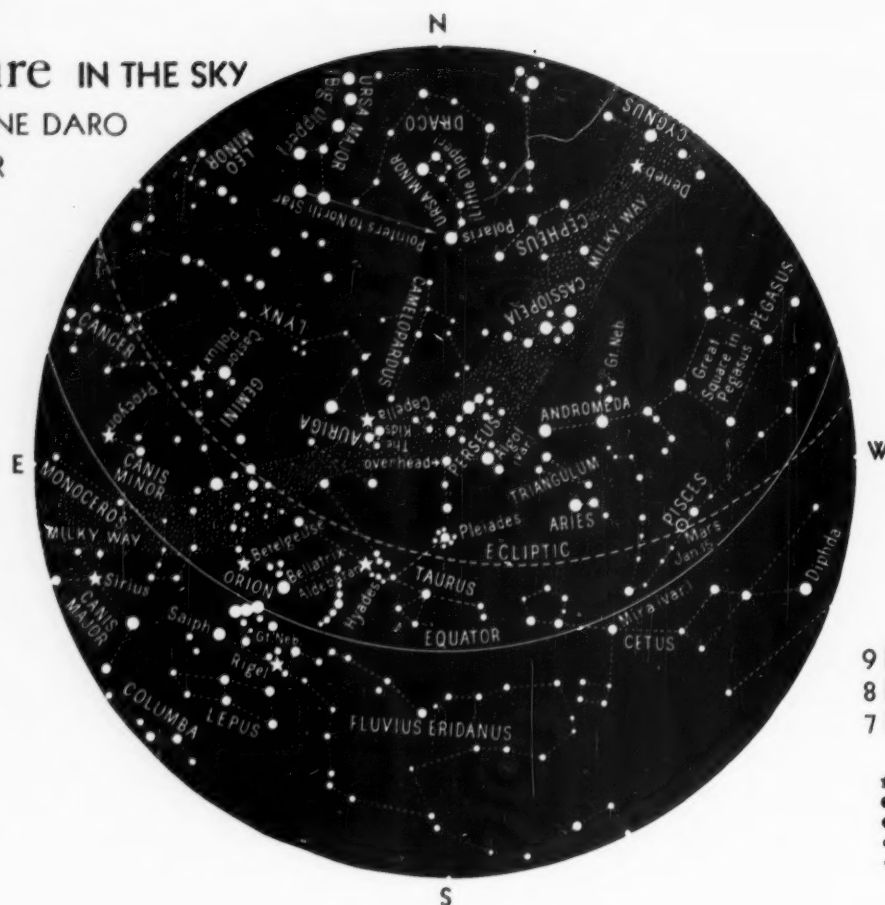
little buck did leave our locality, reappearing only briefly one fall. His twin, with her second fawn, now rules the area about the house and is a chip off the old block, for sure. We have changed the pattern for this lovely doe's treatment. We feed her no "junk" and try to see that she stays wild, except at our back door. Even there, we do not attempt to pet her, or otherwise to encourage too much fearlessness on her part. She eats her peanuts, corn, or apples from our hands or from the ground, and then, after making sure the door has opened for the last time, she leaves, her dignity intact. With the snow becoming a little deeper and the winds more piercing, she and her family will leave for winter quarters, and we, her friends, will be uneasy until she reappears at this place of comparative safety. ❀ ❀ ❀



Pretty and an 8-month old twin, wondering if there is anybody in that house today. The sunny hillside at their rear is the place to which they often retired for a cud-chewing rest after a snack.

Nature IN THE SKY

By SIMONE DARO
GOSSNER



9 P.M., Jan. 1
8 P.M., Jan. 15
7 P.M., Jan. 31

To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the

map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

The Heavens in 1957

THE YEAR 1956 has been a busy one for astronomers. The near approach of Mars, last September, was observed simultaneously by many observatories of the world, and particularly in southern latitudes where the view was better. Astronomers are still in the process of pooling the results and of discussing their observations. They agree at least on one point—nobody saw any canals.

The martian surface was all but blotted out by what seemed to be tremendous dust storms in the planet's atmosphere. The radio-astronomers at the Naval Research Laboratory in Washington, D. C., were able to pick up a faint radiation from the planet. This puts Mars in the category of planetary radio sources, along with Venus, which the same group of astronomers detected as a radio source last April, and with Jupiter, detected for the first time in 1955 by another group at

the Department of Terrestrial Magnetism. Saturn is yet to be heard from.

The past year was also a year of steadily increasing solar activity. The maximum of the present solar cycle is expected to occur at some time in 1957, or early in 1958.

By the end of October, 1956, six comets had been reported for the year. Of these, two were presumably new objects: Comet Mrkos 1956b, and Comet Wirtanen 1956c. The other four were expected returns of known periodic comets. A seventh one, Comet Tchernepashtshuk 1956d (with my apologies to the printer), could not be found by other observers. On closer scrutiny it has been assumed that the "comet" must have been a spurious image, possibly the "ghost" of Venus.

A number of periodic comets are expected to return in 1957. The best known among these is certainly Encke's

comet, which will return to perihelion next October, although it should be found sooner inasmuch as its orbit is well known and observers will be searching for it. Encke's comet has the shortest period of any known periodic comets, only three years and one-third. In 1818, it was seen by Pons at Marseille, France. Using Pons' observations, Encke computed its orbit and proved conclusively that this was the same comet observed by Mechain in 1786, by Caroline Herschel in 1795, and by Thulis in 1805. Altogether, Encke's comet has been seen at 43 returns since it was first observed in 1786.

There will be four eclipses in 1957, two of the sun and two of the moon.

The solar eclipse of April 29-30 will be annular in a very small region of the Arctic Ocean, due north of the Ural mountains. But, for all practical purposes, it will be seen only as a partial eclipse in most of Asia, the north Pacific Ocean, the north polar regions, the northwest territories of Canada, and Alaska. In the United States, the partial phase of the eclipse will be seen shortly before sunset in Minnesota, Colorado, North Dakota, South Dakota, Idaho, Montana, Utah, Wyoming, Oregon, and the State of Washington.

The solar eclipse of October 23, 1957, will be total in an extremely small and inaccessible region off the coast of Antarctica. As a matter of fact, only the definitive computation of the eclipse revealed that it would be total at

all: Oppolzer listed it as a partial eclipse in his *Canon der Finsternisse*. The partial phase of the eclipse will take place mostly over water. Over land, it will be visible in South Africa, the southern part of Madagascar and New Zealand, and most of Antarctica.

A total eclipse of the moon will take place on May 13-14, 1957. The total phase will last one hour and eighteen minutes, but will not be seen in the United States, because most of the eclipse will be over by moonrise.

Another total eclipse of the moon will occur on November 7, 1957. The total phase will last only thirty minutes. The beginning of the eclipse will be visible in most of North America except the Atlantic States.

There will be a transit of Mercury over the sun's disk on May 5, 1957. The first half of the phenomenon will be seen during late afternoon in most of our country, except on the East Coast. West Coast residents will be treated to the full length of the transit. Amateur observers are hereby reminded not to look directly at the sun through telescopes or binoculars of any description, as this would cause permanent eye-damage, or even blindness. The only safe way to view the sun is to project its image on a screen.

Venus will be a morning star until the middle of April, and an evening star for the remainder of the year. It will reach its greatest brilliancy for the year on December 24, 1957.

Mars will be in the evening sky until September 21, and in the morning sky for the rest of the year. It will

be faint and inconspicuous, traveling in the most distant part of its orbit. On September 10, it will be farthest away from Earth, at a distance of 247 million miles. This is more than seven times its distance on its nearest approach of 1956. Accordingly, its apparent diameter will be only one-seventh as large as it was then.

It is presumed that the year 1957 will witness the first launching of a man-made satellite. This proposed experiment has been described previously in this magazine, in October, 1955, and in December, 1956. It will be part of the United States' participation in the International Geophysical Year.

Fifty nations will collaborate in the IGY, during the period from July 1, 1957, to December 31, 1958. This eighteen-month "year" has been so chosen as to provide a complete overlap of seasons in both hemispheres, and to include a period of solar maximum. In the words of Joseph Kaplan, president of the U. S. National Committee for the IGY: "This world-wide study primarily embraces those fields of geophysics in which observations must be conducted simultaneously over the earth if we are to achieve significant progress in our understanding of the earth and its atmosphere."

Although astronomy and geophysics are two distinct disciplines, they share many common problems. A study of the earth's atmosphere may be of great value to the

meteorologist who seeks to further his understanding of weather patterns. But, at the same time, such a study yields essential information to the astrophysicist who is trying to unravel the effects of solar activity.

Similarly, precise determinations of latitude and longitude are of great concern to the geodesist who is trying to measure the size and shape of the earth. But they are equally important to the astronomer who wants to improve the fundamental positions of reference stars.

Although it will take several years to integrate the tremendous amount of observations obtained all over the world during the IGY, all persons concerned with the physical sciences will await the results with great anticipation.

In the month of January, the New Moon will occur on January 1 and January 30, and the moon will be full on January 16.

The earth will be at perihelion on January 3 at 1:00 a.m., Eastern Standard Time. At that time the earth will be nearest the sun on its yearly course.

Mercury will be unsuitable for observation until the latter part of January. By the end of that month, it will be seen as a morning star, rising about an hour and one quarter before the sun. On January 28, it will be two degrees south of the waning crescent of the moon.

Venus will be equally hard to observe. Still a morning star, it will rise barely an hour before the sun. On January 21, it will be three degrees south (*continued on page 52*)

BURRO

*Burro with
The gentle eyes,
You are patient,
Humble, wise—
As long ago
You knelt before
A Child that beast
And man adore.
And you shall kneel
Again tonight
When in the east
A star shines bright,
When in the east
A star shines bright!*

Ethel Jacobson

Nature IN THE SCHOOL

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University,
and Director of Nature Education, The American Nature Association

Winter Insects in the School

OF COURSE the easiest way to study insects in the school in winter is to get a library book and read about them there. It is also one of the most unsatisfactory ways to study them. True, you can pull the book off the shelf at 10:15 A.M., when your schedule calls for it, but you cannot go out at any specific time of day, or on any specific day, and expect to see insects crawling around on the snow. If some child comes dashing into school exclaiming that the snow is black "with bugs," it would be a poor teacher who would remark that we cannot study insects until later in the year. When that time comes you will not, in all probability, be able to find the insects that started all the excitement. It is to help teachers who may find themselves with a winter insect opportunity that we provide the special insert in this month's *Nature Magazine*.

Of course, some teacher may wish to suggest to some youngster that he might like to see if he could find insects on the snow on a bright day. We have suggested a few that leap, a few that crawl, and some that fly. We have pointed out that while some look like spiders they have six legs instead of eight and cannot therefore be spiders. We have suggested that youngsters, who like to haunt streams at any time of the year, in late winter try to find a wet rock from which stoneflies are freeing themselves to take to the air. It is not at all difficult to find mated pairs of these insects on the snow when they are in season.

February 2 is groundhog day when, legend has it, the groundhog's shadow indicates a prolonged winter. About the same time some youngster, poking his way around outdoors, may find a woolly bear caterpillar. While deflating the myth about the groundhog, it might as well be

worth while to get things straight on the woolly bear, with the help of our insert.

Butterflies and moths flitting about a woodland in winter, or a cabbage butterfly over a patch of snow near a barnyard, should be sufficiently remarkable to stimulate some inquiry. Do not pass up the opportunity. Be sure to ask some youngster to bring into school a few of the dead tops of cattails, but be sure that he does not break them open in school or the room will be filled with flying fluff. Try to find in your cattail the larvae of both the cattail borer and the cattail moth, and point out to some young fisherman that the two-inch borer in the cattail stem makes good bait at a time of year when good bait is not too abundant.

Watch for snow fleas

Someone surely will some day find a patch of snow covered with snow fleas that leap strangely in all directions. Here is a common animal about which entomologists know little. Why not suggest to some science talent worker that he or she tackle the task of telling the world what the story is. Do not expect to find the answer in some book; it is doubtful if you will find it there. Mixing something like a few snow fleas with an alert student observer, under the direction of a sympathetic teacher, in the past has produced some worth-while results. I am sure that you can find the snow fleas and the student, and I hope that you will wish to carry your share of the educational load provided by this situation.

If you wish to study insects in winter without getting your feet and hands cold you still can do it in almost any school. Schoolroom windows are frequently the best of collecting grounds. There are few schools in which there are not on the windows, at some time during the winter, some ladybird beetles, some

cluster flies and possibly a few polistes wasps. Let me suggest that, if these animals are with you, that you have the youngsters observe if they are always on the same windows, or if at some time of the day they seek east windows and at other times west windows. Are the south windows more heavily populated than are the north windows, and, if so, why is this the case? Cluster flies, which are so conspicuously sensitive to changes in light and temperature and so ubiquitous and cheap that they can be found in almost any school, still have not found their way into the school outlines in biology or Nature study. Here is a fine example of the refusal of teachers to teach about anything that they cannot find discussed in books.

I was recently asked to prepare some film strips, for use in schools, by one of the major producers of these devices. It had to be on the subject of conservation, but the series also had to deal with the subjects most frequently mentioned in school books that deal with conservation. Here we have an example of the text not only limiting the field of study but of depriving a teaching device of its greatest opportunity to enrich study in a given area. I doubt that I will accept the responsibility offered me in spite of the fact that one such series that I prepared has proven spectacularly successful financially.

Insects on window panes

We have such a variety of the household insects we suggested for study in winter that most of the essentials of a good biology course could be presented through animals that live this winter on your window panes. The cluster fly is a splendid subject for the study of tropisms, such as those dealing with light and physical contact. It also is involved in the study of parasitism, since its larvae live in the body of the earthworm. Its story involves such matters as whether or not it can be considered valuable since it destroys earthworms, the economic importance of which might be worthy of careful consideration. This study involves the resentment of housewives who do not like their window curtains soiled by crushed cluster flies. It also involves some word study, if we try to determine why they are called cluster flies, why they cluster, and why they cluster

where they cluster. The answer is to be found in our chart, or in the flies themselves.

The ladybird beetle found on your schoolroom window in the dead of winter also suggests some good science work. Is it safe to accept what we find in many school texts that all ladybird beetles are economically valuable? Ask some bean farmer in the Southwest what he thinks about the Mexican bean beetle. And if you are interested in geography, and happen to live along the edge of the accepted range of these beetles, why not learn when and if the creature moves into your territory. Again we find an animal that makes us aware of some of the dangers of the generalizations so glibly passed on to us by superficially trained science textbook writers.

Let us hope that you are not solely academically interested in winter insects. All will not be lost to you if you take up a little etymological entomology, or entomological etymology. Just look at a few of the common and scientific names in this month's charts. We find the name boreus, and no one should associate that with mid-summer. Then we find, for the crane fly, the genus *Chionea*. A glance at a good dictionary will show that this must be associated with the Greek for snow. Again, we find the species name for the early spring stonefly is *vernalis*. What could be more appropriate? Still further, the species name for the winter stonefly is *nivalis*, and we are not surprised to find that scientists use such terms as *nivosus* to refer to something that is snowy, or full of snow. To return to our snowfly, *Chionea*, we find that its specific name is *valga*, which means bow-legged, and nothing could be more appropriate for that insect. We might go on with this angle of the subject, but you should be able to go on from here with the help of a good dictionary, or such a book as Jaeger's *A Source-book of Biological Names and Terms*, published by Charles Thomas of Springfield, Illinois. If you happen to be one of those etymological entomologists you simply must have this book. 🐞🐞🐞

Bulletins

"Potomac Playlands" is a 102-page booklet issued by the Interstate Commission on the Potomac River Basin, 203 Transportation Building, Washington 6, D.C., as a guide to vacationing in the Potomac River

Valley. A collaboration of several authors, it covers fishing, hiking, canoeing, tidewater boating, hunting, swimming, rock climbing, cave exploring, Nature study, and parks and forests. \$1.00.

"Hawks in Kansas" is the title of the Vol. 3, No. 1, October, 1956, issue of The Kansas School Naturalist issued by Kansas State Teachers College, Emporia, Kansas. It is inspired by recent instances of vendettas against hawks in Kansas, and seeks to present up-to-date thinking about the importance of these fine birds. Free to Kansans.

"Forestry as A Profession" by Arthur B. Meyer is an excellent bulletin for young men considering a career as a forester. It is published by the Society of American Foresters, Mills Building, Washington 6, D.C., for 25 cents.

"Menominee Report" is a 57-page bulletin, issued by the Citizens Natural Resources Association of Wisconsin, 2728 North 85th Street, Milwaukee 10, Wisconsin, setting forth the story of the Menominee Indian Tribe and steps planned in their behalf. There is no charge for the booklet, but the CNRA is supported by voluntary contributions to its work and any such may be sent to John F. Dahlberg at the address given above.

"Responses of Vegetation to Fire" by James R. Sweeney is a 249-page, illustrated report on the study of herbaceous vegetation following chaparral fires. It is published by the University of California Press, Berkeley 4, California, for \$2.00.

"Saving America's Wilderness" is a reprint of a speech by Hon. John P. Saylor of Pennsylvania in the House of Representatives, and an analysis of proposed legislation to establish a National Wilderness Preservation System. Copies are available on request from The Wilderness Society, 2144 P. Street, N.W., Washington, D.C. Another reprint of a similar speech by the Hon. Hubert H. Humphrey, Senator from Minnesota, entitled "Wilderness Preservation," is available from the same source.

"Seed Crops of Forest Trees in the Pine Region of California" is Technical Bulletin No. 1150 of the U.S. Department of Agriculture and is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., for 20c.

For Binoculars

During the past quarter-century Harry Ross has designed, manufactured and distributed many unique optical and scientific essentials. He now announces a new item called "Bino-Tach," an interesting device that improves seeing with binoculars and takes the fatigue out of doing so. This is an attachment that fits every make and size of prism binocular and also any regular photo panhead, tripod or tripod accessory. Thus it holds the binoculars firm, making it possible to use them as a telephoto lens and for astronomical use because the images will be steady. Weighing only a few ounces and simply constructed, this gadget can be put on and taken off binoculars in a jiffy. It should be specially useful for anyone who finds it difficult to hold binoculars. This new item sells for \$6.60, and Mr. Ross's address is 70 West Broadway, New York 7, New York.

Forestry Awards

Four awards for outstanding services to forestry were made at the 56th annual meeting of the Society of American Foresters. To Samuel T. Dana of Ann Arbor, Michigan, the Sir William Schlich Memorial Medal. The Gifford Pinchot Medal was awarded to Inman F. Eldredge of New Orleans. Special awards for biological research contributing to the advance of forestry were made to Leo A. Isaac of Portland, Oregon, and Philip C. Wakeley of New Orleans.

Fifty Years

The Fall, 1956, issue of the Cornell Rural School Leaflet is a Teachers Number and a tribute to those who have made the leaflet possible over a span of fifty years. Assembled by Dr. Eva L. Gordon, this latest leaflet reprints parts of earlier issues, starting with the first, dated December 1, 1896, and prepared by Liberty Hyde Bailey.

Directory

Enlarged in scope, the 1956 conservation directory of "Organizations and Officials Concerned with the Protection of Wildlife and Other Natural Resources" has been issued by the National Wildlife Federation, 232 Carroll Street, N.W., Washington 12, D.C. It is available at forty cents a copy.

THE Nature CAMERA

By EDNA HOFFMAN EVANS

Enter
1957

WITH THE APPROACH of the New Year, I have been seriously considering the need for some resolutions that might change (for the better, I hope) attitudes toward and outlooks on photography. There follows, accordingly, a list of photographic New Year's resolutions, together with some explanations and discussions as to how they happen to have been made.

First: I am resolved to try to take better pictures. In doing so, I may take fewer pictures because I want to give more time and effort to those on which I finally do click the shutter.

In recent years, it seems to me, there have been increasingly more demands on the individual's time. Youngsters and adults alike, this busy modern life that we lead seems to make increasingly greater inroads on our time and our energies.

The photographic trips I have made recently have been crowded into such short spaces of time that there has been little or no opportunity to search out the best angles, or to wait for the right shadows. This is not the result of laziness; I work hard at picture taking—work up a real sweat, usually. But of late there has been an uncomfortable pressure of time, and my pictures have suffered as a result.

In order to be "sure" of a shot, I have developed the habit of taking several duplicates—just in case one of them came through the developing process with a scratch or a spot on it. In taking those duplicates I have made little effort to vary lighting, or exposure, or angle. Thus, it is often the case that I have reproduced a mediocre picture several times instead of getting a single good one.

Curbing enthusiasm

Second: I am going to make a big effort to keep myself from getting so "carried away" by enthusiasm that I neglect the essentials of good photography.

Too many times lately I have released the shutter and "hoped" for

a passable result. This is poor photographic technique. Good pictures do not happen by accident—except on rare occasions to the lucky sort of person who can bet on a thousand-to-one shot and win. I never have had that kind of luck.

This tendency to "snap and hope," I imagine, is closely allied with the same factors that brought forth Resolution Number One. I see a picture possibility and I know that it may not repeat itself in the foreseeable future. So I snatch at it with my camera, knowing all the while that I have not taken time to gauge accurately the lens aperture and exposure time. Sometimes, even, I scarcely take time to focus. Of course such hurry-up tactics are necessary for an on-the-spot news photograph. But no hobbyist needs to operate that way.

Third: I am going to try to keep more accurate records of my various shots so that I will be able to repeat successful combinations and avoid too many repetitions of errors.

This resolution will be one of those that will be hardest for me to keep. I detest book-work and record-keeping. On the other hand, I know that such activities, dull as they may seem, will pay off. Some camera enthusiasts recommend that the photographer keep a pocket notebook handy in which to make a record of the timing, exposure, and other pertinent data on every picture made. That way the photographer never need have the feeling of baffled frustration that comes when he tries to recall whether a picture was taken at 1/25 or 1/250 second, at f:4 or f:11.

I have a series of slides that illustrates my point exactly. Last summer I bought a pola-screen and I tried it out on a banana blossom against the sky. I used several combinations of time and exposure, plus several different positions of the screen. My results, obviously, are different but (since I recorded the combinations on a scrap of paper and then lost the paper) how I produced each—alas, I cannot recall.

Snapshooting nearby

Fourth: I am going to pay more attention to photographic subjects close at hand.

I have plenty of shots of far-away places, shots that I traveled considerable distances to get. But shots of my own home area, of the scenes I see each day and the places where I spend most of my waking hours—I do not have any. I discovered this, to my amazement, when the Camera Club to which I belong wanted to put together an exhibit of pictures from the local area. I noticed also that I was not the only member whose collection was slim on local scenes. Just because the pastures seem greener elsewhere, we should not forget the familiar ones at home.

Fifth: I am going to continue to think of photography as a hobby, and not as a series of contests and competitions. Too much emphasis on competitions ultimately takes hobby photography out of the pleasure category and transforms it into hard work.

I am heartily in favor of Camera Clubs. Also, I think competitions are fine things. But lately, in my effort to keep up my "score" in the club competition, I have stopped thinking of photography as "fun." As a result, I have gone out searching grimly for pictures, as though on an assignment. I began to *work* at my hobby instead of enjoying it.

In our competitions, in our pursuit of "recognition," and in our efforts to collect points and lead to pretty ribbons and club standings, we hobby photographers get to be like the bridge players who take the game too seriously. We are like the golfer who "plays for blood," or the gambler who cannot stay away from the race track. Recreation goes out the window, and we find ourselves saddled with another "job."

To please myself

Sixth: I am going to take pictures that please my own fancy rather than to suit some jury or set of judges.

This resolution goes hand in hand with the resolution that just preceded it. Judges and photographic juries know a great deal about photographic techniques, but they do not know everything. Also, they have their likes and dislikes, just as do the rest of us. Opinions vary, tastes differ. Even the experts do not always agree. Would any group of sculptors, for example, ever agree on



This is a black-and-white reproduction of a color slide sent to me by Mrs. Dorothy Naas of Oak Harbor, Washington. Looking east, it shows Cascade Pass in Chelan County, Washington. It is a summertime view and no doubt the pass is now covered by many feet of snow. A reader of "The Nature Camera," Mrs. Naas was interested enough to ask for our advice about cameras. That she chose well, and learned to use her equipment skillfully, is indicated by the series of seven excellent color slides that she sent. The above is one of them.

how to replace the missing arms of the Venus de Milo, or could a group of painters ever decide on a single change that might be made in the Mona Lisa? Of course not.

I have sat in on enough photographic judging sessions, and I have listened to the comments of enough juries to know what takes place. One judge likes "moody" pictures, another goes for skies, while a third looks for corner distractions. Some juries throw out anything that resembles a "pretty" postcard picture, others search for that very quality. The photographer who tries to please

everybody often ends by pleasing nobody, himself included.

Seventh: I am going to try to remember that some pictures are taken just for the record and, more important, that such pictures seldom if ever are salon possibilities.

Many times in my travels I take pictures under far from ideal conditions. I know at the time that the outcome will be nothing but a shot for the record. None the less, I am usually disappointed when the pictures are finished and my results are no better than I originally expected them to be. Perhaps, in this respect,

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Enjoy Nature first

Eight: I am going to remind myself from time to time that it was my liking for things pertaining to Nature that brought about my interest in photography to begin with. Accordingly, I am going to enjoy Nature first, and if that enjoyment produces a picture, I have thereby increased my enjoyment.

Here again is another phase of the hurry-up and bustle that I have dealt with before. Photography, I think, points up and emphasizes an enjoyment of Nature because it makes the person more aware of details. The Nature photographer, I am convinced, "sees" more than the non-photographic Nature lover. But enjoyment and preservation of Nature is much more important than the pictures. That is the way I intend to keep it.

Ninth: I am going to remember that not all people like the same things that I like, photographic or otherwise.

I have felt a little hurt, I will admit, because some of my pals are more impressed by a collection of pictures from Europe than they are by the pictures I took in the back yard last summer. My stay at home pictures—to me—are just as interesting as shots from Holland, from Rome, of Pompeii, and of "our ship-board companions going over." Thus, if my globe-trotting friend is asked to show her pictures more often than I am, I am going to accept the fact, enjoy both sets of pictures, and let the situation ride. After all, my friend traveled several thousand miles to see the Bridge of Sighs. Not many people would go across the street to see a mushroom or a preying mantis.

Tenth: I am going to distinguish between my herd instinct and my abilities for solitary enjoyment.

Camera clubs serve several excellent purposes. So do solitary trips in pursuit of specific pictures. Club field trips, for example, are herd-like expeditions. There is company to be enjoyed, as well as techniques to be shared. But not all phases of photography lend themselves to group endeavor. If my results from such a field trip prove to be disappointing, it may be because I do not do my best work with someone breathing down my neck or looking over my shoulder.

The list of resolutions is getting long, and rather complicated, as well as philosophic. From here on I will be briefer.

More night shots

Eleventh: I will try for more night shots. They are interesting in and of themselves, and they often produce gratifying results.

Twelfth: I am going to try to keep my pictures simple; too many details make for an unpleasantly "busy" picture.

Thirteenth: In my effort to slow down, I am going to use slower film. "Fast" film sometimes sacrifices delicacy of detail for speed. I am going to preserve the former.

Fourteenth: I am going to edit my films more carefully, culling out repeats and mediocre pictures. This I am going to do promptly instead of waiting until a large batch accumulates.

Fifteenth: In my reading, I am going to go back to the works of earlier photographer-naturalists. Magazines and photographic writers of today are so concerned with high-speed this and that they must wear themselves out carrying around so much equipment. Maybe, Thoreau had the best idea after all.

So end my Photographic Resolutions for 1957. I will be interested in reader reactions to them. In the meantime—Happy New Year. 🍷🍷🍷



Nomads

Newcomers to the ranks of efficient but inexpensive cameras are the Nomads, manufactured by the producers

of View-Master products, Sawyer's, Inc., of Portland, Oregon. These light, good-looking cameras are for the 127 and 620 film size, and are made of heat-molded plastic with decorative metal fronts. Both cameras have subjects in focus from four feet to infinity. We have tried both out with black and white and color, and with flash, and the results have been excellent. The Nomad 620 has an automatic shutter lock that prevents double exposures. Each is specially easy to load, and the view finder is outstanding. A synchronized flash is activated by two penlight batteries and uses peanut bulbs, which are released with a plunger-type ejector. The Nomad 127 retails for \$4.95, to Nomad 620 for \$6.95 and the flash attachment for \$2.50.

R.W.W.

Action for Swans

With latest figures showing a static situation with respect to the numbers of trumpeter swans in the United States, the Fish and Wildlife Service is taking steps to increase the numbers by artificial extension of nesting areas. Swans at the Red Rock Lakes Refuge, where the greatest number of these birds is found, show a decline in the reproduction rate. It is therefore planned to live-trap and remove to other areas 20 cygnets and 20 non-breeding older birds a year to relieve overcrowding and to establish new breeding flocks. Malheur National Wildlife Refuge in Oregon and Ruby Lake National Wildlife Refuge in Nevada, where experimental transplanting has already taken place, will continue to be sites for such swan releases.

Merited Award

As the artist who designed and successfully promoted the first three wildlife stamps issued in the new series by the United States, Bob Hines, wildlife artist of the U.S. Fish and Wildlife Service has been given an award of \$500 and a Certificate of Merit in recognition of his services. The issuance of these stamps, depicting the wild turkey, the pronghorn antelope and the king salmon, was made on recommendation of President Eisenhower. In making the award to Bob Hines, Director Farley of the Fish and Wildlife Service said that "this creative act is a valuable effort in the direction of publicizing wildlife conservation."

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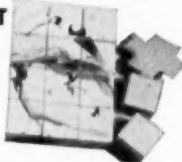
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Treasure Chest

(Continued from page 21)

it is quite inoffensive, subsisting almost entirely on jungle fruit.

Best known of the island's birds is the oropendola, or "giant oriole," whose hanging nests, like shopping bags, can be seen in almost every treetop. The male bird selects the site of the nest but takes no part in its building. He merely sits on a nearby branch and sings, perhaps to encourage the female in her labors.

Most fearsome of the crawling things is the great black tarantula, which has been known to kill and devour at one meal a whole small mouse. Like the blue scorpion, the tarantula can inflict a painful, but not necessarily fatal, bite on humans. Of more concern to old hands on Barro Colorado is the iguana, or arboreal lizard. Not that he is pugnacious; just indifferent. When the ugly creature wants to descend from a tree he just drops, landing with a thump on whatever or whoever is beneath!

If you like mysteries, there is the soft-bodied, wormlike peripatus. Among all living creatures this worm-insect, which looks like a caterpillar two or three inches long, is one of the foremost contenders for the title "missing link." It has the circulatory system and various other functions of an insect. Its nervous system and some other features are more akin to those of worms. It may be quite close to the common stock, possibly among the first animals to invade the land, from which both insects and extant worms arose. Specimens of fossil peripatus, similar to these living ones, have been found in rocks of Middle Cambrian geological age, formed half a billion years ago.

In the shadowy gullies of Barro Colorado lurks a silent, little black and green frog. Just over an inch long, it is quite conspicuous against the damp dead leaves because of its velvetlike black skin with spots of vivid green. Other creatures of the jungle keep their distance, for this is *Dendrobates auratus*, the poison-arrow frog. From its skin exudes a curious poison that is a strong irritant, especially if it gets in the eyes or against any mucous membrane. When dried, it becomes a virulent internal poison. Indians of Panama and northern South America once used the toxic substance on arrowheads.

As Barro Colorado enters its second decade as a division of the Smithsonian, what are its plans for the future? Its staff does not, of course, propose subjects for study and research. People who go to Barro Colorado generally know what they want, or what they are looking for in advance. The major problem will continue to be upkeep of equipment and facilities for their comfort and convenience, a continual struggle against the inroads of humidity, mold, rust, fungus, and the like. Electric dehumidifiers have been purchased, and metal and plastics are being substituted for wood where practicable about the station. Painting is a never-ceasing task; also clearing away growth around the compound, for the jungle quickly reclaims its own.

Despite all of this, former Curator Zetek, in his last report, deplored "the high cost of transportation that still keeps many away, or considerably curtails their stay. It is hoped," he adds, "that means can be found to hold seminars of twenty or so undergraduate students for about three months each year. Such a program has tremendous possibilities, and is receiving careful consideration."

The Canal Zone Biological Area's small budget has been supplemented for a number of years by contributions from scientific and business organizations, but maintenance understandably is rather high. The charge for those making one-day visits is \$3 per person. This provides for the launch trip from Frijoles to the island, a guide on the trail, noon meal, and launch trip back to Frijoles in time for the evening train. The rate for scientists in residence is \$5 per day.

As for long-range projects, studies in various branches of science—notably biology, ornithology and zoology—are being continued and enlarged. Such practical experiments as termite control, checking of deterioration and corrosion of photographic equipment, and the effects of the tropics on various fabrics and building materials will probably receive increasing attention. Perhaps the most important factor, as far as the scientist is concerned, is that the island's wildlife and primitive environment will remain unaltered, that here the primeval jungle will remain very much as it was before the coming of the white man. With-

in a few years it may constitute the only tropical wilderness still within easy access of the scientists of the world.



Deiropyx

(Continued from page 41)

appearing somewhat larger. They would distend the throat, erect a low crest on the back of the neck, bob up and down a few times, and then leap open-mouthed at us, accompanying the leap with a sharp squeak, almost a hiss. Such actions are merely an instinctive effort to frighten away a potential enemy. When grasped, most *Deiropyx* would try to bite. But some just squeaked loudly or mewed plaintively, and a few went into a trance-like state—"playing possum," it would seem. We have never encountered another lizard with a bag of tricks like *Deiropyx*; the loud squeaking, particularly, was quite startling, for the majority of United States lizards are voiceless.

Leaving Rancho Mundito with regret, we visited other parts of the island. On our return trip, during brief stops at Havana, Mariel and Key West, our catch was viewed with considerable interest by the local citizens. A sizeable crocodile, which we had caught in the Cienaga de Zapata, attracted the most attention; the big Cuban boa was marveled at; tree-frogs, huge toads, goggle-eyed anoles and slim Cuban whip-snakes all received their share of attention. Almost no one gave a second glance to the mottled *Deiropyx* lizards perched on a tree branch in a roomy cage. Certainly no one suspected that we regarded these rather drab reptiles as the most interesting creatures of the entire lot!

Heavens

(Continued from page 45)

of Mercury.

Mars, in Pisces, will be high above the southern horizon at sunset. It will set in the west around midnight on January 15.

Jupiter, in Virgo, will rise in the East at about 11 p.m. on January 15, and will remain visible for the rest of the night.

Saturn will be found in Ophiuchus, a few degrees north of Antares. It will rise in the southeast about three hours before the sun, and will be low over the southeastern horizon at dawn.



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Nature AND THE MICROSCOPE

BY JULIAN D. CORRINGTON

A Piece of Granite

*Those snow-crowned, granite battlements of hills
The Hills, BERTON BRALEY*

IN MY HAND is a chunk of granite, trimmed and shaped as a study specimen for the student of geology, as shown in the accompanying photograph. You may find this form of rock listed in supply house catalogs, and you may see it in larger masses in cemeteries and public monuments and buildings, for it is the very symbol of permanence and durability. Its rough texture and grayish hue endow it with an appearance everyone associates with great strength and resistance to corrosion. Is the microscope able to do anything with such a gross and opaque object? Can it tell us anything about the nature, composition, and history of this stone?

Close examination with the eye alone reveals that the rock is not all of a piece, but that it is made up of different substances, occurring in no particular order, but scattered irregularly and more or less in proportionate amounts throughout. A hand lens, especially the superior 10X aplanat, will disclose no more than the naked eye can see, but the parts may be discerned much more effectively. Best of all instruments for this sort of study is a 10X widefield binocular, with strong illumination from above.

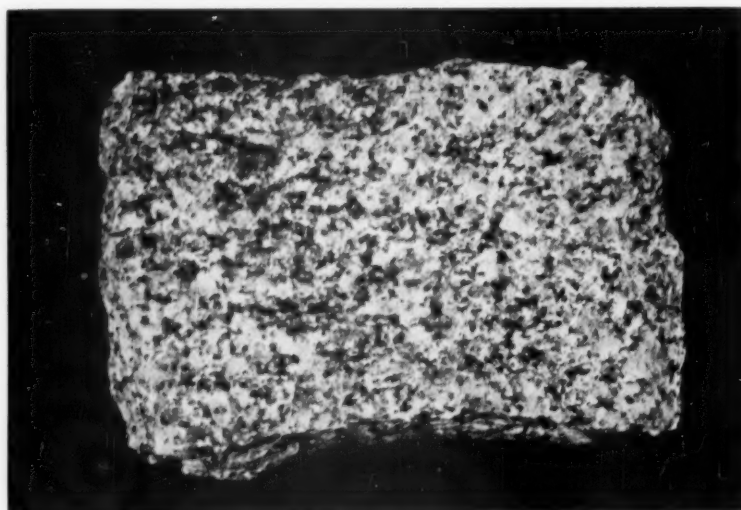
When a specimen of *normal* or *biotite granite* is thus surveyed, its crystalline structure is apparent, for it is composed of *phenocrysts* (visible crystals). Further, all of the different crystals are about of the same size and there is no *groundmass* (background material) in which crystals are lacking, or are of microscopic dimensions. Such a rock as ours is said to exhibit granitic or granitoid texture, named from this, the best known example. The opposed construction shows porphyritic texture, as in granite porphyry, another variety of this rock and one in which the phenocrysts are embedded in a groundmass containing *aphanitic* (invisible) crystals, or else is glassy. Of the

phenocrysts in biotite granite, the transparent ones are quartz, the opaque or milky ones are feldspar, and the dark brown or black ones are mica.

Mineral components

These three components are minerals, whereas granite is a rock, and hence we run upon the necessity of some basic definitions at the outset

A *rock*, by contrast, is an aggregation of mineral matter. In the geological sense there is no size limit; a grain of sand is a rock, and the vast Rock of Gibraltar is another. No definite amount is implied; a mass of clay or gravel would qualify as a rock, or each particle also as one. In the popular sense a rock is a piece of stone, as our hand specimen of granite. A rock may be composed entirely of a single mineral, but is generally made up of two or more, often many more, combined in various ways and proportions. It is usually not possible to write a chemical formula for a rock. Even organic materials may qualify, as a lump of coal. Rocks fall into three classes on a basis of their origin—igneous,



Hand specimen of biotite granite. (Photo courtesy Ward's Natural Science Establishment, Inc.)

of our quest. A *mineral* is either a chemical element, as gold, or a compound, as salt, that occurs in Nature as a result of inorganic processes. All but a few, as water or mercury, are solids at ordinary temperatures. With rare exceptions a mineral has a definite chemical composition, expressing itself in crystalline form, optical properties, and other demonstrable features, such as degrees of hardness or kinds of luster. The study of minerals constitutes the science of mineralogy and one who pursues this work is a mineralogist. As a science, mineralogy has descriptive, determinative, and historical aspects, and leans heavily on crystallography, the science of crystallization and of the structure of the many kinds of crystals and how they form and are classified.

sedimentary, and metamorphic. The description and classification of rocks is petrography, while the broader science of their origins and histories is petrology.

In barest outline, the sequence of petrographic events on earth begins with the *primary* rocks. These crystallize and solidify by cooling from molten masses of elements and compounds within our planet's crust, and are classed as *igneous* rocks (Latin, *fire*). If forced out at the surface in volcanic eruptions and as flows of lava they are *extrusive*; if forced up from far below, following cracks and fissures in older, overlying rocks, or pushing up strata of superposed sedimentary rocks, and cooling before reaching the surface, they are *intrusive*. The molten mass that wells up is a *magma*; vast solidified

magmas covering many miles in extent are *batoliths*, while masses intruded into sedimentary rocks, flat on the bottom and dome-shaped above are *laccoliths*. Small streams from magmas may work their way horizontally between beds of rock and, on cooling, become *sheets* or *sills*; or they may solidify in fissures at any angle, including the vertical, as *dikes*. Igneous extrusives include basalt, very dark, tough, dense and heavy; obsidian, resembling black glass; and pumice, white to gray or brown and, due to great numbers of tiny air-filled cavities, so light that it will float on water. Intrusive rocks are such as gabbro, syenite, diorite, and notably granite, the subject of our present survey.

Making of mountains

The primary rocks become thrown up into great folds of the crust, continental in scope, during mountain-making. *Diastrophism* is the term that describes the series of processes, relatively rapid as geologic time is figured, by which the rocks are folded, faulted, buckled, and otherwise deformed as the earth's crust shrinks. There follows a much longer period of quiet *denudation*, the exposed rocks being worn away. This occurs through two chief agencies: *Weathering* embraces the action of frost, the sun's heat, and rain; *erosion* includes the wearing away of materials by wind (flowing air), streams (flowing water), and glaciers (flowing ice). Rocks, like everything else, must expand and contract with the alternating heat and cold of day and night, summer and winter. This causes *exfoliation*, the peeling off of thin layers and flakes. The expansive force of freezing water is well known, especially to those who have incurred plumbing bills from burst pipes, also the pressure exerted by growing plant roots, as in sidewalk upheavals; ice and rootlets, in tiny crevices, shatter rock, enlarging the cracks. Rain picks up carbon dioxide from the atmosphere and becomes a weak carbonic acid that assists in the chemical weathering of rocks. Oxygen combines with other elements on exposed surfaces of rocks and the resulting oxidation is a powerful factor in crumbling rocks into soil. In excavations one can see the work of ages laid bare; soil at the surface, then subsoil, rotten rock, and unaltered rock, in succession, one blending into another.

On level plateaus or very gentle

slopes, the weathered material remains in place where formed, constituting *sedentary soil*. The water-soluble carbonates and salts of lime, soda, potash, and magnesia are usually leached out in rainy climates and carried to the sea in the run-off water, leaving the balance as *residual soil*. Where the land slopes more steeply, rains and gravity move the rock debris downhill, depositing it in places as *colluvial soil*, or it is washed into streams and carried to valleys where, in situations so shaped that the velocity of the stream is slowed, deposition of *alluvial soil* takes place, as in flood plains and sandbars. Your microscope will show that sedentary and residual soils are composed wholly of angular fragments, colluvial soils have a mixture of angular and rounded particles, and alluvial soils show most or all of the grains rounded by abrasion.

Through long time

Eventually, in the long reaches of time that are measured in geologic periods and eras, all of the land will be worn down to base level, and the many cubic miles of material that once was elevated will have reached the sea, there to form vast deposits of *sediment* in deltas and estuaries. As these pile up, the pressure of overlying sediments gradually compresses the lower layers into rock. In this manner arose the second great class of rocks, known as *sedimentary* from their origin, and *stratified* because occurring in layers or strata. Since solid particles sink to the bottom in quiet water they form horizontal strata; at one age these may be predominantly sand, at another time clay, and so visibly distinct layering takes place. Those composed of the bits of former rocks are termed *clastic* or *fragmental rocks*, and are *secondary* as compared with the primary igneous rocks. Examples are shale, or mud rock; sandstone and conglomerate, the last a mixture of cemented pebbles, gravel, and sand. Another form of sedimentary rock is precipitated from solution; limestone is an example, although this rock may also be clastic in origin, in which case the cemented particles will be broken bits of shells and corals, secreted by former organisms, which, in turn, received their lime (calcium carbonate) from solution in the ocean water. Thus the same molecules are worked over and over in the long history of the earth.

At some stage thereafter, this immense shifting of weight—removing material from a land area and piling it up along the continental shelf—brings on another cycle of diastrophism, and many of these underwater strata are uplifted to form new land masses and even mountains, whereupon the denudation processes start up all over again. The new strata may be buckled, folded, even overturned, and it is the geologist's problem to unravel the sequence of events from a study of the formations as they appear today. Stratigraphy is that branch of geology that deals with the arrangement and succession of strata. The gist of this grand drama of rock cycles was known by the great Florentine of the fifteenth century, Leonardo da Vinci, but unfortunately for the development of geology, his findings were not published until our own day.

Either igneous or sedimentary rocks may become transformed by great heat and pressure to make rocks of a third class, the *metamorphic rocks*. This will happen, for instance, when a great batholith of molten magma rises from far below and cooks the intruded rocks, causing *contact metamorphism*. The minerals again become fluid and, on later cooling, recrystallize in different manners owing to the differing circumstances. Such changes will also occur under great pressures, as in mountain-making, and are examples of *regional metamorphism*. Shale becomes slate, sandstone turns to quartzite, limestone to marble, and granite is metamorphosed to gneiss.

In our next instalment we shall prosecute the study of this piece of granite that now serves as a paper weight on our desk and shall explain how geologists, using microscopes, have unraveled the history of each of its component parts.

New Measuring Magnifier

EDMUND Scientific Corporation announces a new vest-pocket version of its pocket comparator. The new model is about half the size of the pocket comparator, making it easier to carry about on the job.

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The reticle pattern of the junior measuring magnifier is designed to compare hole diameters as well as take linear measurements. A special feature of the reticle is the thickness comparison scale, a series of parallel lines .002" to .007" apart. This

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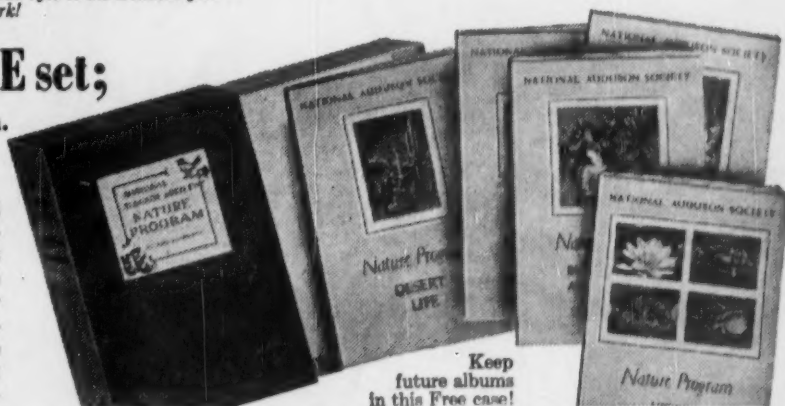
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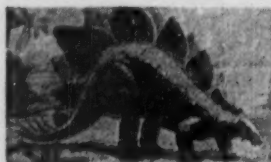
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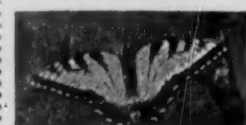
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